THE MODEL ENGINEER

Vol. 95 No. 2369 THURSDAY OCTOBER 3 1946 6d

The model of a 100-ft. Merryweather Fire Escape, by Mr. T. A. Hill, which was awarded a Silver Medal at the "M.E." Exhibition, shown with the latter half extended. This model was built with very limited tool equipment, no lathe being available, and all turning was done with a hand drill brace

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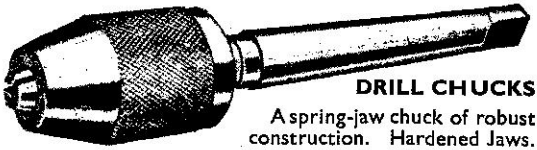

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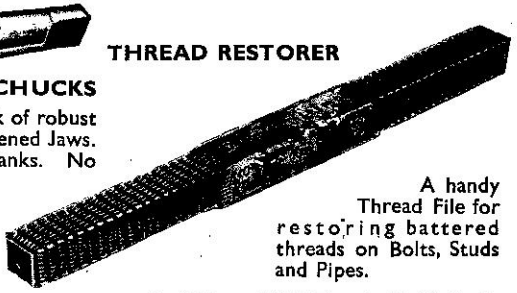

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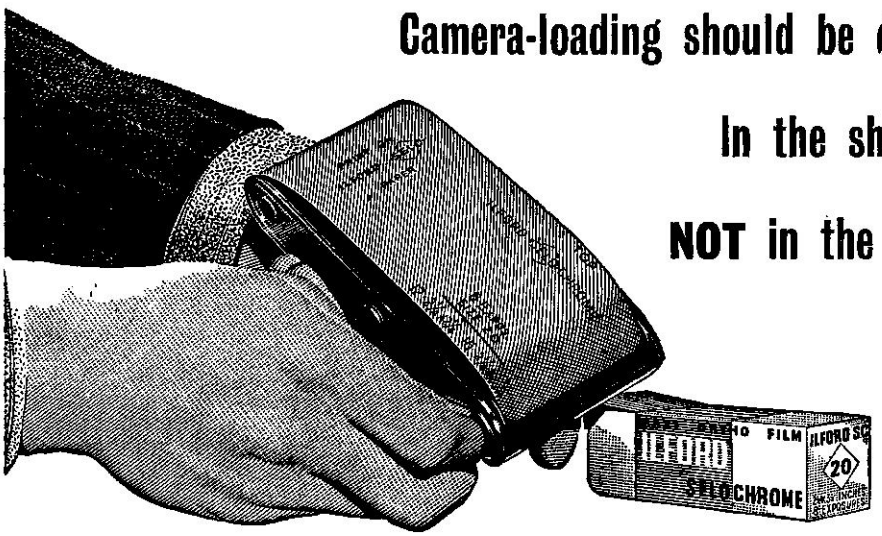

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NOT in the sun

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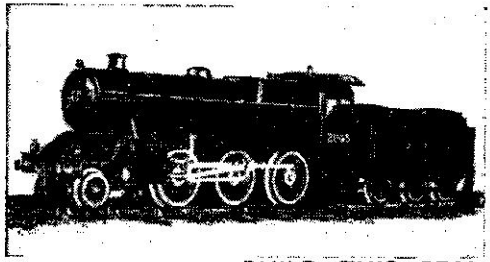

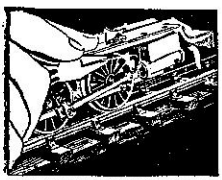

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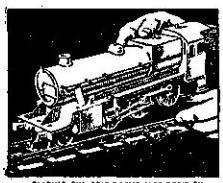

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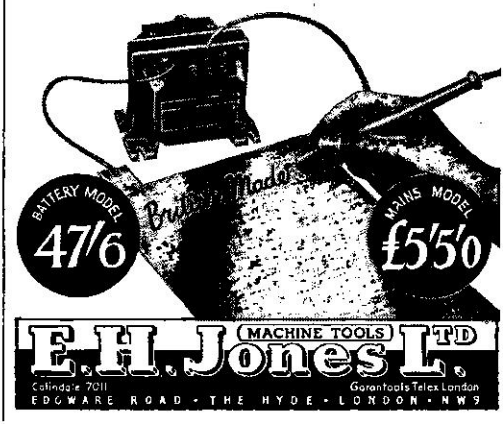
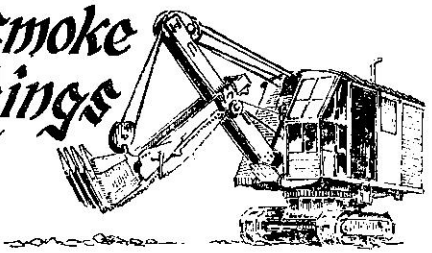


THE
MODEL ENGINEER
Percival Marshall & Co. Ltd., 23, Great Queen Street, London, W.C.2
VOL. 95. No. 2369. OCTOBER 3rd, 1946

Smoke Rings



More Exhibition Memories

A READER wrote to enquire if he might be permitted to disregard the "Do not touch" notices on the model stands if he brought his wife who was blind. Of course, we promised all facilities and when the lady came a special steward was provided to pilot her and her husband round the exhibits. Her delicate sense of touch enabled her to understand and appreciate many of the most interesting models, and so a special and very welcome visitor was made happy. Mr. A. H. Nettleton's "Congreve" clock was a constant source of interest and wonderment. The explanations of how it worked volunteered by various visitors were many and wonderful, and suggestions of "perpetual motion" were not unheard. It deservedly took a silver medal. The medical profession was well represented among the model makers. I was glad to meet Dr. Longridge and son, Dr. Fletcher, of Bradford, and son, and Dr. Rowlands, of Northampton. These included two previous championship cup winners and one prize winner this year. Dr. R. L. Robinson, the well-known collector of historic models, was very happily engaged on the locomotive running track. The smallest exhibit on view was Mr. R. S. Lewis's microscopic mains electric motor, only really visible through a powerful magnifying glass. At the other extreme was Mr. R. Renshaw's' 9-ft. pedal propelled motor bus which came by road from Rugby, to the astonishment of the public on the way.

Glasgow's New Premises

I AM pleased to read in a letter from Mr. John W. Smith that the Glasgow Society is now happily housed in some extensive new premises. The accommodation available includes a lecture room, a workshop, a Council room, and a library, with an entrance hall almost large enough to lay down a locomotive test track. In addition there is an odd room available for "dirty work" such as steaming and soldering and brazing. This real home for the Society is situated at 60, Clarendon Street, Glasgow. Mr. Smith has also sent me the Society's Bulletin, No. 13, which contains an excellently produced summary of the meetings and activities during the past few months. This is something more than a bare report of lectures and regattas; it is a chronicle of club life which reflects the admirable spirit of mutual good-will and understanding which pervades the membership of this very successful Society. Let me quote a definition of model engineering which I discovered buried in an article entitled "Power Boat Revival." It runs:—"Model engineering brings members from all walks of life into a mutual understanding and interest in each other's problems. It is a brotherhood with a keen sense of honour; a friendliness which is a thing to be prized without greed for power or wealth, above and apart from the pettiness and struggle of everyday life. It is indeed something worthy of our very best." I do not know who wrote that, but it aptly epitomises the philosophy which I have been expounding in THE MODEL ENGINEER for nearly half a century. I could not have expressed it better myself, and I am delighted to find this spirit of unselfish brotherhood so well exemplified in the membership of the Glasgow Society.

Malden's Track Opening

A "DEEP depression" in the weather report threatened the proceedings on the day selected for the official opening of the Malden's Society's continuous track at their new Club Ground at Thames Ditton. The threat resulted in a continuous downpour of rain during the earlier hours of the day, but this did not damp the enthusiasm of the three hundred or more enthusiasts who arrived, and there was certainly no depression apparent on their faces as they watched Mr. Marshall's "Mustang" and other locomotives doing their stuff in great style. Driver Maxwell, of G.W.R. fame, thoroughly enjoyed himself in the freedom of a continuous run, and scored lap after lap with his locomotive, to the great applause of the spectators. He gave his professional approval to the track, and said it was one of the best of its kind he had ever tried. Mr. F. W. Bontor, Mr. and Mrs. Austen-Waltons, Mr. K. N. Harris, and other notabilities of the model world shared in the adventure of a most enjoyable "christening" of London's latest outdoor railway.

Percival Marshall

It Happened at the "M.E." Exhibition

By "Smoke Rings"

(*Continued from page 270 "M.E." September 19, 1946*)

THAT Mr. W. F. A. Way's electric locomotive, the winner of the "Gill-Knight" prize, carried explanatory labels in six languages—English, French, German, Italian, Spanish, and Russian. This was appreciated by our cosmopolitan visitors, who came from almost every European country.

* * *

That in one family a domestic coolness arose five years ago because the husband spent too much time in his workshop. A joint visit to the exhibition restored mutual understanding and happiness.

* * *

That the Earl of Northesk, Past President of the S.M.E.E., was a welcome and enthusiastic visitor. He told me that he hoped his military duties would soon enable him to devote a little more time to his models.

* * *

That Mr. M. P. Picknell, of Birmingham, produced a particularly clever artificial hand from his pocket, made for a friend who had lost both hands. An admirable example of the beneficent side of model engineering skill

* * *

That Major Tom Lawson, late President of the Nottingham Society, enjoyed a spell of driving on the locomotive track. He told me that when on service in the Middle East he wandered down a back street in Baghdad, and was astonished to find in an Arab bookshop a complete range of Percival Marshall & Co.'s publications. A breath of home-life which delighted him.

* * *

That many visitors promised models for next year's show. Dr. Rowlands, of Northampton, a cup-winner for a beautiful ship model in 1938, revealed that he had another ship nearly ready.

* * *

That Mr. A. C. Palmer, from Bristol, expressed the view that model making needed model tools. To prove his point he produced from his pocket an array of the miniature tools he used in his work. I admired a model hand-brace, which was particularly useful for delicate drilling operations.

* * *

That Mr. W. H. Dearden, the first gold medallist of the S.M.E.E., took a cup of tea with me. Although he has passed the four-score milestone in years, he looked remarkably well and much interested me with an account of a 1-in. scale Caledonian locomotive on which he is at present busily engaged. It is obviously keeping him young.

* * *

That many experts were impressed by the beautiful workmanship on the diagonal marine engine by Mr. E. B. Wilcox. The nutting and the lagging on the cylinder were fine examples of realistic neatness.

* * *

That including the Competition and Loan exhibits, and the Club and Trade Stands, the number of models on view must have approached the thousand mark.

Mr. Percival Marshall took a special interest in the lathes and tools in the Competition Section.

The M.P.B.A. GRAND REGATTA

Never failing to provide a smile and a surprise, Mons. Suzor makes a welcome return to the scene of many past victories.

THE recent revival of activity in the realm of model power boats, reached a climax on Sunday, September 1st, 1946, with the Grand Regatta of the Model Power Boat Association. Although no new speed records were set up by the boats entered, records were undoubtably set up by the number of competitors and spectators present, and this in spite of the weather, which was, to say the least, erratic! The clubs represented were as follows :—Altrincham, Ayr, Blackheath, Guildford, Kent, Malden, N. London, Orpington, S. London, Southampton, Swindon, Victoria, and Paris (represented by our old friend, Mons. G. M. Suzor). We were pleased to see with us again several well-known faces from pre-war times besides Mons. Suzor, notably Mr. Rankine (Ayr), Messrs. Innocent and Clifford (Victoria), Mr. Innes (Altrincham), and several others.

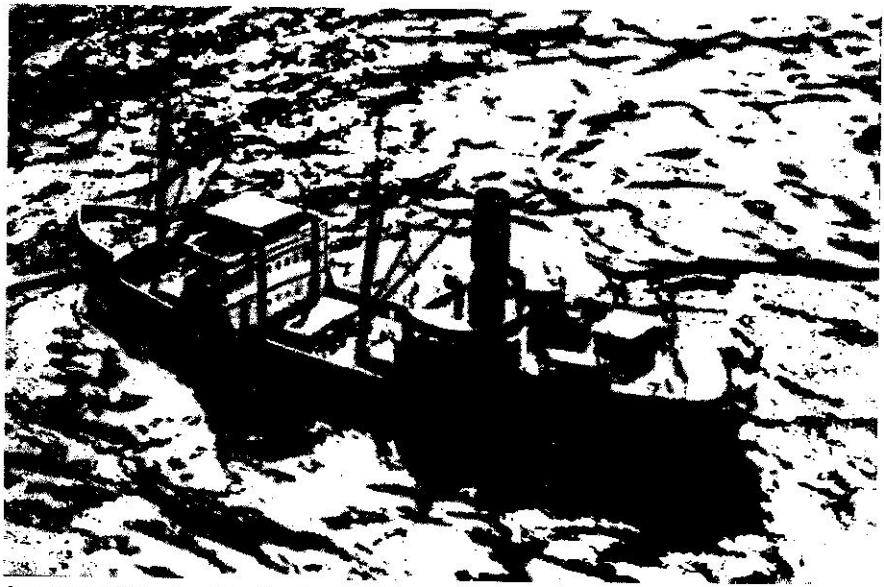
Public address equipment was loaned by Mr. Bontor, of the Malden Society, who also provided a running commentary on the day's events.

The first event was the 80 yards nomination race for straight running boats, over 20 boats being entered. First boat away was Mr. Godfrey's light cruiser "Conquest" (Victoria), making a nice straight run. Good runs were also made by Mr. Hood's "Truant" (Swindon), Mr. Jepson's "Darky" (Blackheath), Mr. Porter's "Slickery" (Vctoria), and several others. Mr. Curtis with his tug "Wortha" (Victoria), returned a correct nomination, followed closely by Messrs. Baker and Benson of the Blackheath Club. A number of boats seemed to be troubled by the wind in this event, causing them to turn to port, the course stewards deflecting them up to the finishing line. This, of course, ruined their chances of getting near the nominated times.

The second event was the 500 yards Circular Course Race for B class boats (15 c.c.). The C class boats (10 c.c. and under) were also run in this event.

Up to this time, we had been favoured with fine weather, but only two boats had run, when a downpour of rain started and competitors and spectators had to seek shelter in haste. As time was getting on, it was decided to put forward the lunch interval and re-commence at 2 o'clock.

Activities were re-started promptly to time, the rain having stopped. Mr. Heath (Victoria) put up a clean run, and bettered it on a second try later, to qualify for first place in the C class boats. Mr. Rankine, with his new boat "Oigh Alba Junior," made two clean runs, the first one gaining him the 15 c.c. trophy, at a speed of 32.2 m.p.h. When Mons. Suzor appeared with his 10 c.c. boat "Mlle. Sylla," the crowd gave him a grand welcome. Unfortunately, Mons. Suzor was right out of luck on this occasion, "Mlle. Sylla" started well, and accelerated to such a speed that it capsized on both its runs, the first time wrenching off the tethering plate, causing Mons. Suzor to make a hasty repair, in order to



An outstanding example of scale modelling: the famous "Banana Boat" "Belle Morss," which includes a complete scale model crew—not to mention the ship's cat

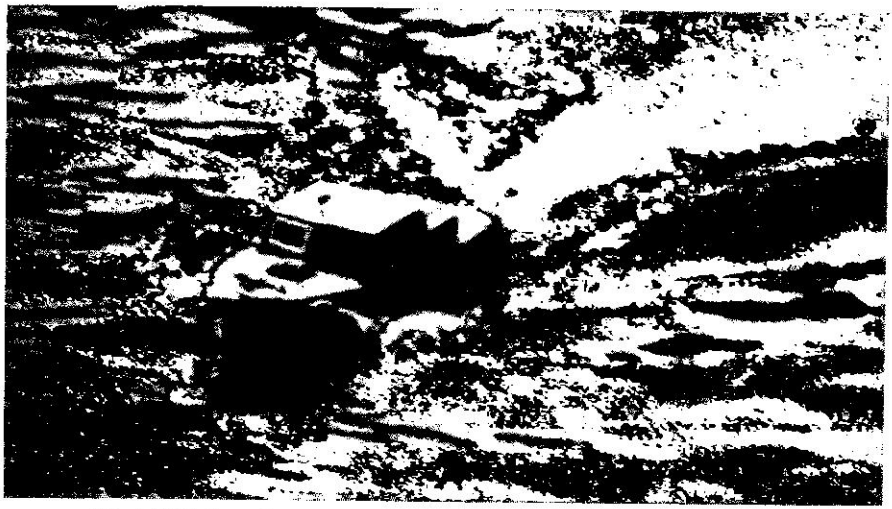
get a second attempt in. Mr. Innes (Altrincham) made a good run with "Satellite," at 31.2 m.p.h., and Mr. Jutton (Guildford), with his flash steamer, also did well with a run at 27 m.p.h.

Mr. Cruickshank (Victoria), with "Defiant II," although running very fast, could not complete the distance on either attempt.

Next event was the Steering Competition, all the boats taking part that had run in the Nomination event. The steering of the boats was the best seen for many years, few boats failing to make a score of some kind. Good scores were made by Mr. Whiting's "Rose Marie" (Orpington), Mr. Browning's "Gondia" (N. London), 9 pts. each. Mr. Eldridge's "Royal Sovereign" (Victoria), 8 pts. Mr. Squire's (Malden), with "Comet," scored 2 bulls and an inner, total 13 pts., but was beaten by Mr. Liffen (Blackheath) with "Freda," scoring the maximum of 3 bulls: 15 pts. Mr. Vanner (Kent) qualified for 3rd place, with "All Alone," 11 pts. Due to the consistent running of all boats, this event went very smoothly, one boat after another making for the target flags, giving the stoppers plenty to do.

During the steering competition, two independent judges, Mr. E. Bowness and Mr. Peter Scott,

Mr. Browning with the tug "Gondia," winner of the Prototype Competition

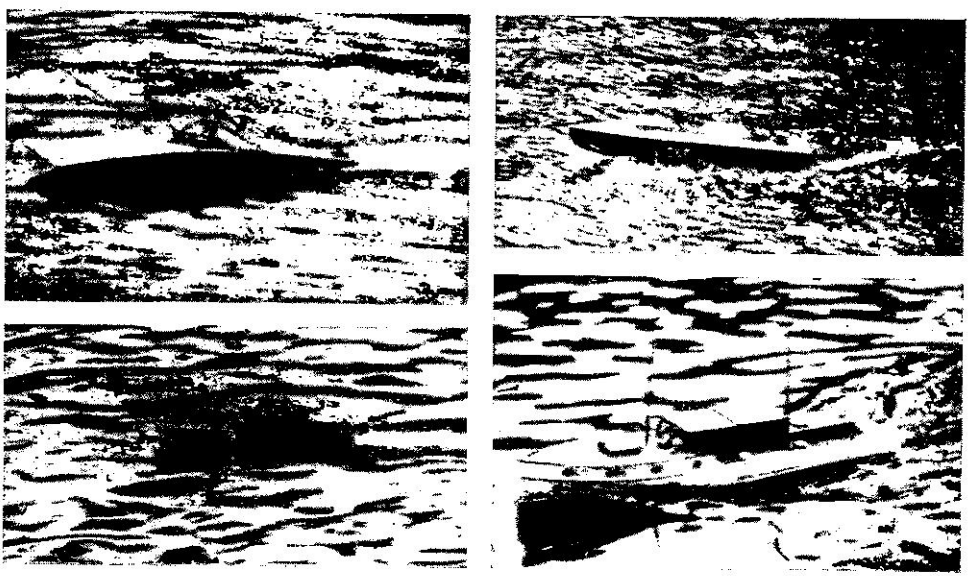


Mr. Phillips's cabin cruiser "Kenvera" in the steering competition

were viewing the boats for the Prototype Competition; as any boat that has won this event previously is barred, this narrowed the field down slightly. The winner was Mr. Browning's tug "Gondia." This boat is a scale working model of great accuracy, and has an excellent performance. Mr. Godfrey's light cruiser "Conquest," and Mr. Porter's "Slickery" qualified for places.

The last event was the 1,000 yards Circular Course Race for A class boats (30 c.c.).

Mr. Marsh (Southampton), with "Sea Devil III," was first away, and completed the distance at about 21 m.p.h. Messrs. S. L. and J. B. Innocent (Victoria), with the British record holder "Betty," came next, but getting away on a slack line, this boat capsized; a misfortune which prevented a second attempt. Mr. Clifford (Victoria) had to withdraw his new 30 c.c. job because of engine trouble, without making a run. Mons. Suzor, entering "Mlle. Sylla" against the A class boats, capsized yet again, almost at the same place as before, and again losing the tethering plate. Mr. Rankine, with "Oigh Alba," made a faultless run, lapping steadily at about 34 m.p.h.



Boats in action: Top left, Mr. Rankine's "Oigh Alba"; Top right, Mr. Liffen's "Freda"; Bottom left, M. Suzor's "Mlle. Sylla"; Bottom right, Mr. Porter's "Slickery"

About half way through this event a thunderstorm, accompanied by torrential rain, called a halt to proceedings for about ½-hour. On resuming, several competitors made their second attempts. One of the two flash steamers entered in this race, Mr. Pilliner's "Frisky" (Guildford) gained the Crebbin trophy, timed over 500 yards, and qualified for 3rd place in the 1,000 yards. Mr. Parris (South London), with "Wasp," put up the best speed of the day, taking 57.16 sec., approx. 35.8 m.p.h.

Mr. Cruickshank, running "Defiant II" (10 c.c.), did 9½ laps at about 36 m.p.h., but ran out of fuel. Two of the boats entering were powered by "Atom V" engines, those of Mr. Weaver (Victoria), and Mr. Tompkinson (Altrincham); they showed great promise, but seem to require some more tuning up.

Before ending this report, mention should be made of several outstanding new engines and boats appearing on this occasion, in particular the 10 c.c. engine of Mons. Suzor, which is a masterpiece of design and ingenuity. The same applies to Mr. Rankine's new 15 c.c. engine; the boat, by the way, is completely streamlined, the engine being totally enclosed.

Due to the periods of rain, the regatta finished somewhat later than usual, and several prize-winners had to leave before the prize-giving.

Results

80 *yards Nomination Race.*
1. Mr. Curtis (Victoria) "Wortha." Error nil.
2. Mr. Baker (Blackheath), "Mercury." Error 0.1 sec.
3. Mr. Benson (Blackheath), "Comet." Error 0.75 sec.

500 *yards Circular Course Race.*
1. Mr. Rankine (Ayr), "Oigh Alba Junior," 31.61 sec., 32.5 m.p.h.
2. Mr. Innes (Altrincham), "Satellite," 32.82 sec.
3. Mr. Jutton (Guildford), 37.68 sec.

Special 10 *c.c. Prizes.*
1. Mr. Heath (Victoria), 39.34 sec., 26 m.p.h.
2. Mr. Weaver (Victoria), 58.5 sec.
3. Mr. Curwen (Victoria) "Elf," 64.26 sec.

Steering Competition.
1. Mr. Liffen (Blackheath) "Freda," 15 pts.
2. Mr. Squires (Malden) "Comet III," 13 pts.
3. Mr. Vanner (Kent) "All Alone," 11 pts.

Prototype Event.
1. Mr. Browning (N. London) "Gondia."
2. Mr. Godfrey (Victoria) "Conquest."
3. Mr. Porter (Victoria) "Slickery."

1,000 *yards Challenge Trophy for* 30 *c.c. Boats (A Class).*
1. Mr. Parris (S. London) "Wasp," 57.16 sec., 35.8 m.p.h.
2. Mr. Rankine (Ayr) "Oigh Alba," 60.5 sec.
3. Mr. Pilliner (Guildford) "Frisky," 62.86 sec.

Crebbin Trophy, Mr. Pilliner, "Frisky," 26.9 sec., 38 m.p.h.

Wembley Trophy, Mr. Pilliner "Frisky" (for boats not having previously won a prize during the year).

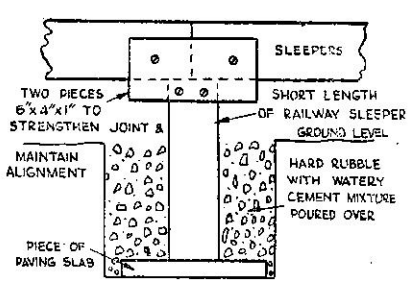
Suggestions for a 3½-in. Gauge Track

By F. Dudley

I AM keenly interested in articles on outdoor passenger-carrying tracks, being in the fortunate position of having a straight run of about 120 ft., and now desire to lay down a track.

In the course of my service with the R.A.F., I have travelled extensively over the country and talked with many model engineers on the matter. I have come to the conclusion that more thought should be given to the question of low first cost, and find that there is a dearth of information concerning reasonably-priced layouts.

I therefore propose to try out the scheme shown in the sketch, which I think adequately explains the idea. As the railways will have a good deal of relaying to do, old sleepers should be plentiful.


SLEEPERS
TWO PIECES 6"x4"x1" TO STRENGTHEN JOINT & MAINTAIN ALIGNMENT
SHORT LENGTH OF RAILWAY SLEEPER
GROUND LEVEL
HARD RUBBLE WITH WATERY CEMENT MIXTURE POURED OVER
PIECE OF PAVING SLAB

If funds permit, 1-in. scale Vignoles-section rail, as sold by THE MODEL ENGINEER advertisers before the War, would be laid on sleepers spaced fairly closely. Failing that, rough drawn-steel strip would be used.

Preservative would be a liquid known as black or tar varnish, obtainable from the local gas-works. This I can thoroughly recommend. My workshop was given its last coat during the Easter holiday of 1939, and, although requiring another coat now, it is as yet, undamaged by the weather. The cost of it is only slightly more than that of creosote.

Any comments or suggestions from readers would be very welcome.

J. W. H. on

Brake Horse-Power

WHEN model engineers describe or exhibit small power units, it is seldom indeed that any claim or statement is made concerning the actual power of the model, although all kinds of colourful expressions abound with which to denote pride, satisfaction, disappointment, remorse or disgust in respect of a small machine's performance.

This is probably due to two reasons. From the model-maker's or model owner's standpoint, the power output of most model engines, motors, turbines, water motors, wind motors, etc., etc., could only be expressed accurately as a very diminutive fraction of the work which has been assumed to be a respectable one-minute's performance for a "fair to middlin'" or some other kind of horse, namely 33,000 foot pounds.

No doubt the owner of a small and primitive steam turbine, which "could not pull the skin off a rice pudding," can hardly be expected to be over interested in its brake horse-power.

Perhaps more enthusiasm concerning real power capabilities of models might be forthcoming if model engineers obtained a charter or Royal assent authorising them to adopt, formally and legally, a more flattering unit of power, say, for instance, the amount of work (expressed as a much smaller number of foot-pounds per minute) which could be got out of an adult mouse under fair and kindly conditions.

A second reason for this failure to brand small power units with an honest rating probably arises from the customary lack of an appliance for determining the actual power output, although such an appliance can readily be constructed, at negligible cost.

There can be no question as to the desirability of being able to compare accurately the power of various models and of being able to form a reliable estimate of their efficiencies.

We are all familiar with the catalogue ratings of $\frac{1}{2}$ h.p., $\frac{1}{8}$ h.p., etc., quoted by manufacturers of small petrol and gas engines and electric motors intended to drive workshop or other machines.

Quite a number of us will have been interested to check these ratings from the electrical outputs of dynamos driven by such units, although the efficiency of small dynamos often remains something of a mystery.

Occasionally when a small power unit is applied to some weight-lifting feat such as driving a model crane or lift it may be convenient to note that a certain number of pounds can be lifted a certain number of feet in one minute, but even in such cases a fraction of the power output may be absorbed in operating gearing, tackle, couplings, and also by reason of friction losses in bearings, before the remaining power is applied to the real purpose of weight lifting.

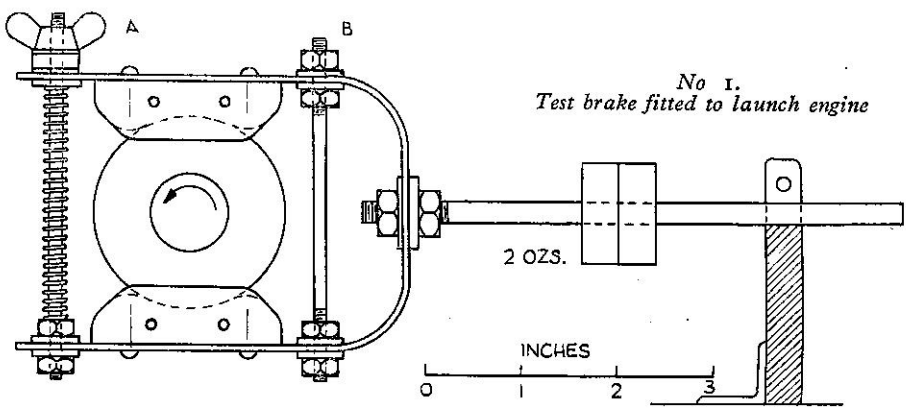
In order to arrive at the actual brake horse-power of a small gas engine, the writer (some years ago) constructed a fairly small-scale replica of a *Prony brake* and with this appliance, together with a revolution counter, was able to establish that the claims of the gas engine's makers (a well-known Cleckheaton firm !), were indeed quite modest and in every way justified.

Since then several other small brakes have been devised and applied to a number of steam engines, an electric motor and a water motor.

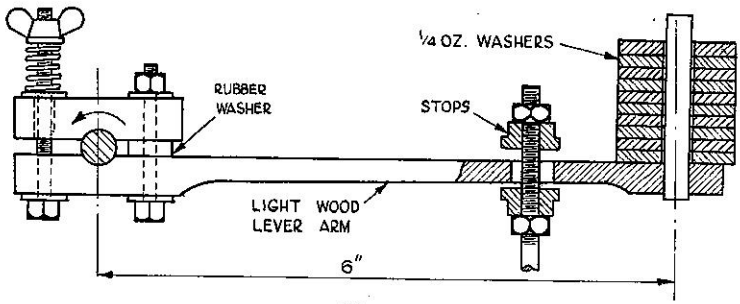
Perhaps a few details may be of some interest, and readers may be able to improve upon the experimental brakes described.

Drawing No. 1 shows a brake used for testing a model launch engine which had a 2-in. diameter flywheel with a face $1\frac{1}{4}$ in. wide.

The two brake blocks are carefully-shaped pieces of Canary pine, $1\frac{5}{16}$ in. wide, each fitted with bolted-on brass side-plates, and screwed to a forked strip of "springy" steel $1\frac{1}{4}$ in. wide and $\frac{1}{16}$ in. thick—obtained from an old bedstead mattress. If hollowed as indicated, and dusted with French chalk occasionally, the blocks will take a smoother grip on the flywheel, and thus avoid or reduce vibration or "chattering" of the brake-lever arm.



No 1.
Test brake fitted to launch engine



No. 2

The brake fork carries two brass bolts of 5/32 in. diameter. Bolt *B* has nuts for setting the spacing of the blocks, and to compensate for wear. Bolt *A* is fitted with a spring, a rubber washer and a fly-nut for adjusting the brake pressure, fairly sensitively, to suit any speed at which the power output is to be ascertained.

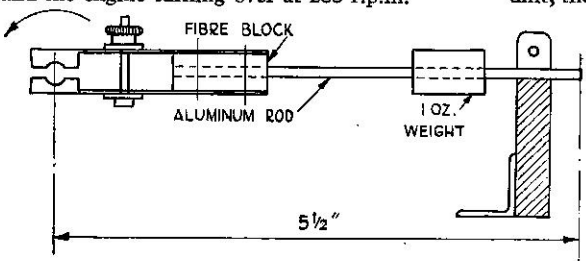
The lever arm is a ¼-in. aluminium rod loaded with convenient sliding weights (in this case 1-oz. brass collars were used), and its outer end rests freely in a vertical slotted post.

A detachable pin is fitted across the slot to prevent the brake being carried round with the flywheel.

If the flywheel rotation is reversed, the lever arm and post will require to be on the other side of the wheel.

The post and the engine under test are mounted on a base-board, with the engine packed up so as to bring the lever arm horizontal.

With the brake pressure adjusted, and the engine running at any desired speed checked by revolution indicator or counter, the sliding weights are moved into a position on the arm so that the arm end is just (and only just) held down against the bottom of the slot in the post. The drawing illustrates an actual test in which two 1-oz. weights were set at 4½ in. from the flywheel centre, with the steam supply well throttled down and the engine turning over at 200 r.p.m.



No. 3

The retarding effect of the brake was then 2 ozs. acting round a circumference of 9 in. diameter, 200 times per minute, and may be stated as :—

⅛ lb. acting through 2 1/3 × 200 ft. per minute,
or 58 ft.-lb. per minute.

The brake horse-power of the engine, at this speed, and under the steam supplied, was therefore :—

$$\frac{58}{33{,}000} = \frac{1}{570} \text{ b.h.p.}$$

Immediately after this test, the steam-cock was fully opened and the brake pressure being unaltered, the r.p.m. quickly rose to 800.

In order to bring the lever arm down on to the stop, it was then found necessary to have eight 1-oz. weights on the arm (its full capacity for this size of weight).

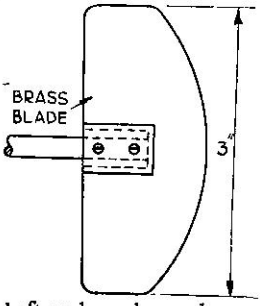
The centre of the weights then being 4 in. from the flywheel centre, the calculation for b.h.p. became :—

½ lb. acting through 2.1 × 800 ft. per minute,
or 840 ft.-lb. per minute,
closely 1/40 b.h.p.

Thus, under the increased steam supply, the engine speed was quadrupled, but the power output rose to about fourteen times its former amount. In the space of an hour or two, an interesting series of tests can be made on a small engine so as to reveal its power output under different conditions of steam supply, boiler firing and, if desired, using different boilers.

The efficiency of a small dynamo—always a matter of serious concern to model engineers—may be checked by noting its electrical output in watts (volts × amps.) when driven at correct speed by a small power unit, and then substituting a suitably-adjusted test brake for the dynamo, so that the power output of the unit when running at dynamo speed is measured. The proportion of the power transmitted to it which the dynamo actually converts into electrical energy is represented in horse-power by $\frac{\text{Watts.}}{746}$

(If the dynamo is found to be wasting 80 per cent. of the horse-power transmitted by the power unit, there will be scope for improvement !)



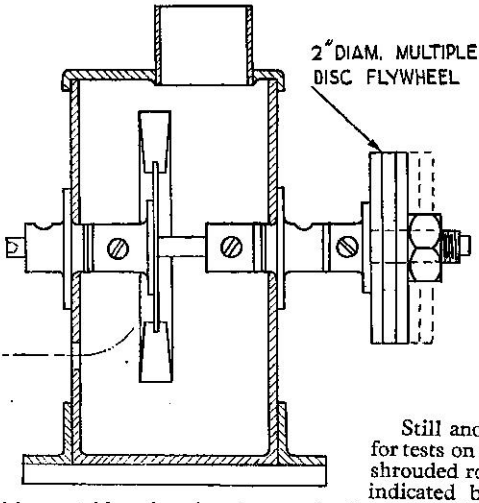
No. 4. Fan brake on ¼-in. shaft

Where a projecting shaft-end can be made use of for testing purposes, a more compact and somewhat simpler form of Prony brake, such as the miniature shown by Drawing No. 3, may be adopted.

This miniature brake was made for use on $\frac{3}{16}$-in. to ¼-in. spindles running up to 3,500 r.p.m., and to check brake horse-power from about 1/500 to 1/50.

For this small instrument, the brake blocks were cut from a ½-in. cube of gunmetal, the cube being drilled with a ¼-in. central hole, and silver-soldered to two steel blades, before sawing through the block. The completed brake somewhat resembles a large drawing pen.

Drawing No. 2 shows another Prony-type brake which was devised for making tests on a 4-in. Pelton wheel, which had 1 in. of the free end of its shaft available outside the bearing.



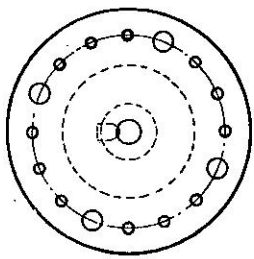
Drawing No. 6 shows a brake used on a small gas engine, and also on a 1¼-in. × 1½-in. steam engine; the brake blocks being "lubricated" with French chalk.

Small fan-brakes, such as the one shown by Drawing No. 4, are very easily constructed and used, but their power absorption at different speeds must be determined by first using them on the spindle of some small power unit for which the power output at different speeds has already been found by brake tests with some other form of brake.

The power required to drive a simple form of fan can be calculated, whether the fan runs in air, water, or oil, but the calculation is rather tedious, and for model purposes, the method of "calibration" mentioned above is more convenient. The fan should always run well clear of obstructions.

The fan blade shown in the drawing is slotted to fit slots cut in the brass boss, and is then silver-soldered accurately in position. The boss used was a standard wireless fitting, known as a "connector," has a ¼-in. hole, and is supplied with two grub-screws.

No. 5. Alternative disc with weights in pairs



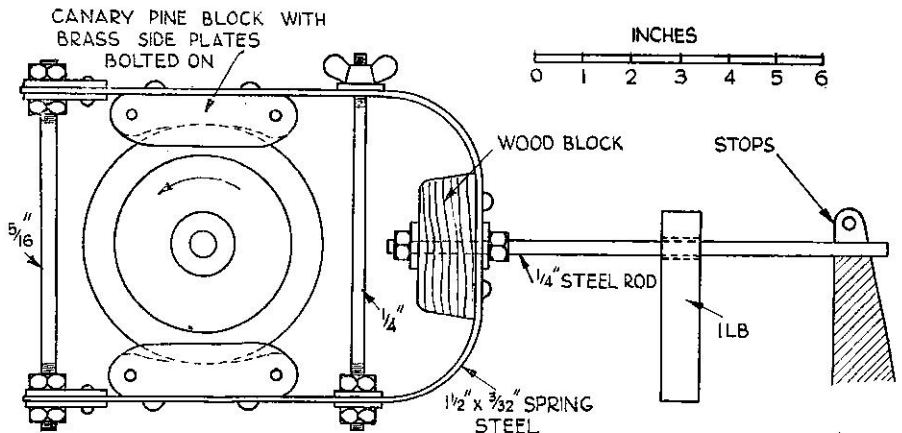
Still another type of brake was devised for tests on a steam turbine with a 32-blade shrouded rotor, 2¾ in. diameter. This is indicated by Drawing No. 5 and consists of a "composite" or "multiple" small flywheel which can have its power-absorbing capacity increased by equal small increments.

Two forms of this brake were made, as shown by the drawing, with equally satisfactory results. Calibration was effected in much the same way as in the case of the small fan-brake, but this can be checked by calculation, by anyone fairly well up in dynamics.

For full-size testing, several other kinds of brakes or dynamometers are commonly used, but these are not all capable of reproduction to a small scale with satisfactory results—as, for instance, the torsion meter used for full-size steam turbines.

In conclusion, the writer would like to know whether the steam-turbine enthusiasts can mention some more appropriate method of checking high rotor speeds than by applying the ordinary "full-size" revolution counter, which is apt to exert a little braking effect on its own account!

Also, it would be encouraging to see "that small hole" put into the end of shafts of model power units a little oftener—to facilitate speed checking by counter.



No. 6. Larger test brake for units of about ⅛ h.p., shown adjusted for ⅛ b.h.p. at 800 r.p.m. on 5-in. flywheel

RUST — By P. G. Forsyth

THIS article is intended to show the nature of rusting, how it arises, and, most important of all, how to mitigate the effect in the model engineer's workshop.

The text books say quite blandly that iron and steel rust when stored in moist air. Now we know that air is always more or less damp, and yet iron does not always rust. It also seems fairly certain that pure iron does not rust when stored under very pure water such as that distilled and treated by the chemists. The conclusion therefore is that rust formation requires oxygen from the air dissolved in water in a liquid form—liquid because water vapour in the air does not give rise to rusting. It is hardly necessary to add that rust is a chemical compound of iron and oxygen only and that the water acts as a medium for the rusting process.

How does liquid water get on to our carefully guarded tools? In general there are three ways :—

(1) By direct contact, in which case the cure obviously is either mend the leaky roof or don't be so clumsy and knock the water bucket over.

(2) By condensation.

(3) By contact with hygroscopic materials.

Condensation

Condensation is our biggest problem, and to explain it a short discussion on humidity will not be out of place. Air always contains a certain amount of water vapour and the maximum that it can hold, or dissolve, to borrow a very useful analogy of solids like copper sulphate being dissolved in liquids like water, depends upon the temperature. Pressure has some effect, but it is relatively small and need not worry us.

Suppose now that we have a fixed quantity of air at say, 90° F., in a glass vessel, and it holds x ounces of water vapour, and that the most vapour the air can hold at 90° F. is y ounces, then we can say that the dampness, or as it is properly called, Relative Humidity, of the air is

$$\frac{x}{y} \times 100 \text{ per cent.}$$

Now let us cool down the air in the vessel without changing anything else. At some other temperature, say 60° F., we shall see mist beginning to form on the inside of the vessel. Clearly then at 60° F., our air can only just hold its x ounces of water vapour and the relative humidity has become $\frac{x}{x} \times 100$ per cent. $= 100$ per cent., although we still have the same amount of air and water that we had at 90° F. In actual practice we generally find that misting or condensation occurs at only a few degrees below normal air temperature, say 5° F. or 10° F. at most, in England.

To return to our workshop, how does condensation occur here? Well, there are at least two ways.

It has been a warm, sunny spring day, the other jobs are going well and that new locomotive steams like—well, nobody's business. Finally, we shut the door and retire indoors to read THE MODEL ENGINEER before turning in, but outside, that warm day that dried up the roads and puddles has become a clear night, perhaps with ground frost. Our thinly insulated shop cools down almost as fast as the air outside. The dew on the leaves has become condensation in the shop, resulting in a sorry state of affairs.

How to cure the trouble? Switch on the electric heating say the plutocrats, but we are impecunious model engineers who have to take a longer view and decide to improve the thermal insulation so that the cooling is slow enough not to permit condensation by the time the shop warms up again during the next day, even though it is unoccupied.

The ideal method undoubtedly is to make an inner air-tight shell of timber, asbestos board, plywood, paper or pulp board, with an air gap or cavity between the outer wall and the shell, and then to plug up any draughty spots by the doors and windows. In my case, this method was out of the question enitirely, but I had got some roofing felt. The workshop is a feather board shed 10 ft. × 8 ft. on brick piers, fitted with doors both ends and a window on one side. The treatment consisted in carefully laying the felt over the outside of the roof and walls so that all the edges were weather tight and the triangular section gaps formed by the boards and felt were preserved as air pockets.

The second source of condensation is not quite so obvious. Nine times out of ten water is one of the products of combustion of ordinary fuels, so that starting up a blowlamp, oil or gas heater will release large quantities of wet and warm air from which water will condense on to the cold tools. There is another complication—burning produces also carbon dioxide which can dissolve easily in the water droplets to form carbonic acid with even more disastrous results in terms of speed of reaction compared to the more normal corrosion of metals.

The cure is mainly a matter of procedure. Try to have the workshop warm before starting jobs like brazing or welding, and when you are ready, open the windows and increase the ventilation. Cold air will come in and sweep away the products of the combustion, and meeting also warm tools, will do them no harm.

If you cannot avoid gas, oil or coke for heating the workshop, arrange a flue so that the hot gases are carried away after warming the shop by transfer through the pipe. The usual closed coke stove is, of course, in order; open fires and flames like oil stoves are the real menace to our peace of mind.

Hygroscopic Materials

Hygroscopic materials is a high-brow way of talking of substances like paper and wood which absorb water from the air. The usual culprits in a shop are corrugated cardboard, brown paper, wood which has not been painted or varnished,

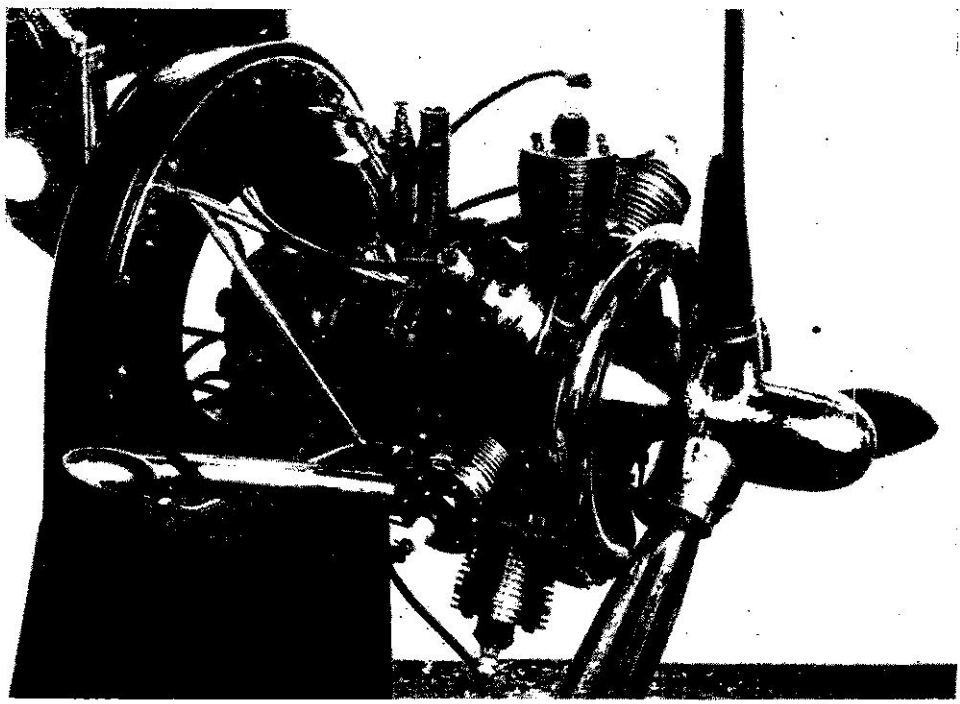
(*Continued on page* 336)

I.C. Engines
at "The Model Engineer" Exhibition

By Edgar T. Westbury

IN view of the rapid progress which has been made in the development of small I.C. engines during recent years, and the corresponding increase in their popularity, one might have expected that the exhibits in this section would have been more numerous, and have shown more sweeping changes in design, than was actually the case. There were, however, several examples of highly advanced and original design, and though strength of numbers might have been considered disappointing, this is no doubt accounted for by the fact that many constructors of I.C. engines are much more concerned with efficiency than with finish, so that the possibility that they might be entered for exhibition is never contemplated. The opinion is often expressed that the I.C. engine model stands very little chance of an award in an exhibition, and although this fallacy has been exploded many a time, it no doubt deters many constructors from showing their engines in public. This is much to be deplored, as it not only gives the quite erroneous impression that the constructors of these engines are in a very small minority, but also deprives other I.C. engine enthusiasts—most of whom are looking for, and capable of appreciating, something deeper than mere surface finish—of a considerable amount of interesting material, providing food for contemplation and discussion.

An aspect of the I.C. engine section which struck me very forcibly was the contrast between the amateur-built and trade exhibits. Whereas the former were comparatively weak in numbers, but widely varied in type and design, the latter were prolific, but much less varied. While this is quite understandable, since the manufacture of engines for sale must necessarily favour the production of fairly simple and conventional types, its logical conclusion is a stereotyped monotony, which, I trust, will never be allowed to develop. It is rather significant that every manufactured engine seen at the exhibition was of the two-stroke type, whereas two-stroke engines were well in the minority in the competition section, and only one of them could be described as conventional in design. There is a moral in this which I hope will not be lost sight of by manufacturers; although the simple two-



Dr. T. Fletcher's 7-cylinder radial two-stroke engine

stroke is undoubtedly the most straightforward production proposition, there is plenty of evidence that the greater complexity of the four-stroke engine appeals to many model engineers, who see more in an engine than just a mere means to an end.

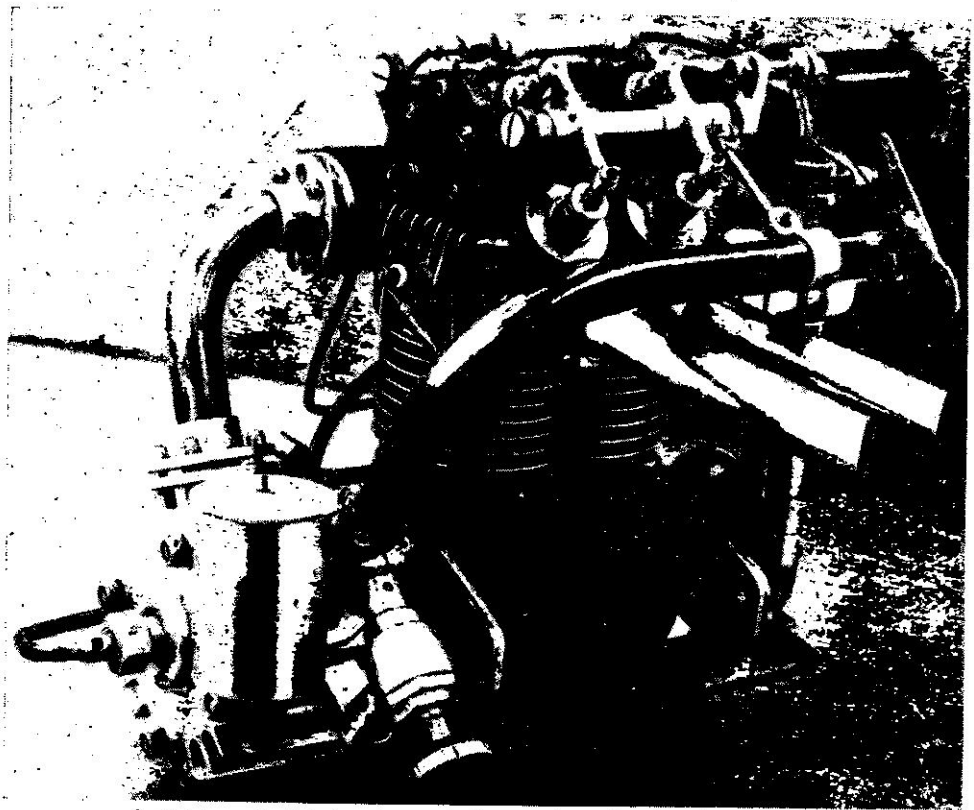
Competition Section

Without a shadow of doubt, the high spot in this section was the 7-cylinder radial engine by Dr. T. Fletcher. As I hope to be able to obtain a more detailed description of this engine for later publication, I will only deal briefly with it here. The cylinders each have a swept volume of about 7½ c.c., so far as my knowledge goes, so that the total engine capacity is just over 50 c.c. All pistons operate on a single crank throw, through a system of articulated connecting-rods, as used on most full-sized radial engines at the present day. The cylinder arrangement and porting are more or less in conformity with normal two-stroke practice, including the use of deflector pistons, but crankcase charging is not employed, and is, indeed, impracticable in a radial engine of this type. Its place is taken by a centrifugal blower at the back of the crankcase, driven by epicyclic gearing to run considerably faster than the engine shaft.

The detail work on this engine is very complete, including a compensated and balanced carburettor and full forced lubrication system. No details of its success as a working model are available; but it certainly *deserves* to be a great success.

Another engine which calls for the highest praise as an experimental venture is the 30 c.c. supercharged twin engine by B. C. Miles. This is intended as the power plant for a racing hydroplane, and has already had a certain amount of success in this capacity, though it is obviously still in the embryo stage of development, and has, not unnaturally, encountered many teething troubles.

As will be seen from the photograph, the engine is of the vertical twin type with overhead camshaft driven by a bevel-geared vertical shaft, and it is equipped with an eccentric vane blower direct-coupled to the end of the main shaft. The finish and detail work of this engine may not satisfy the most fastidious exhibition standards, but it is obviously built to work rather than to look at, and it already bears some minor but unmistakable scars of battle. Workmanship is extremely good everywhere, and leaves little room for criticism in any detail.

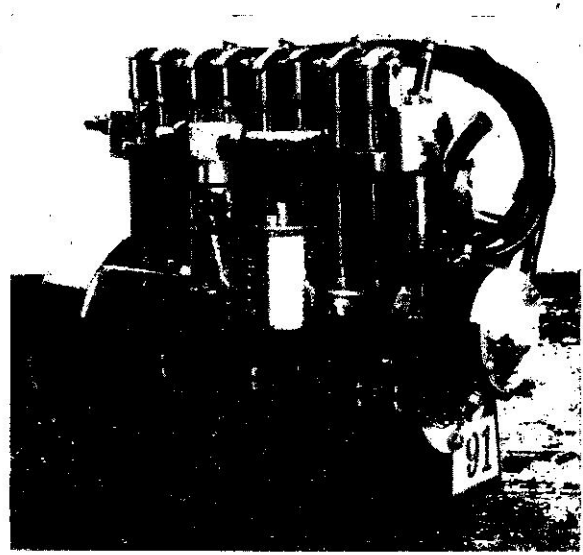


A 30 c.c. vertical twin o.h. camshaft supercharged engine, by B. C. Miles.

An original design of single-cylinder 30 c.c. engine was shown by C. W. Hortop. It is presumably intended for use in a speed boat, and is of the water-cooled type, with overhead camshaft and equipped with an enclosed contact-breaker, a forced lubrication pump, and a

modified "Atom" Type R carburettor. While the workmanship of this engine appears to be very good, and the finish high, there are one or two points about both the design and appearance which seem rather incongruous and unharmonious. I think it was a mistake to finish the crankcase and cylinder to almost a mirror polish, which is out of keeping with practice in engines of this type, and is rendered still more conspicuous by the black finish of the oil pump, and the casings of the camshaft and vertical shaft. The water-jacketing of the head is somewhat mysterious, as it would appear that this component is machined from the solid, and if the water passages go everywhere they should, it is not at all clear how it was done. Moreover, the back of the head (not seen in photograph) is provided with cooling fins, which should not be necessary if the water-jacketing has been properly carried out. More information of the internal design of this engine would be very welcome.

Two examples of four-cylinder engines



P. J. Goodchild's 14 c.c. water-cooled four-cylinder engine

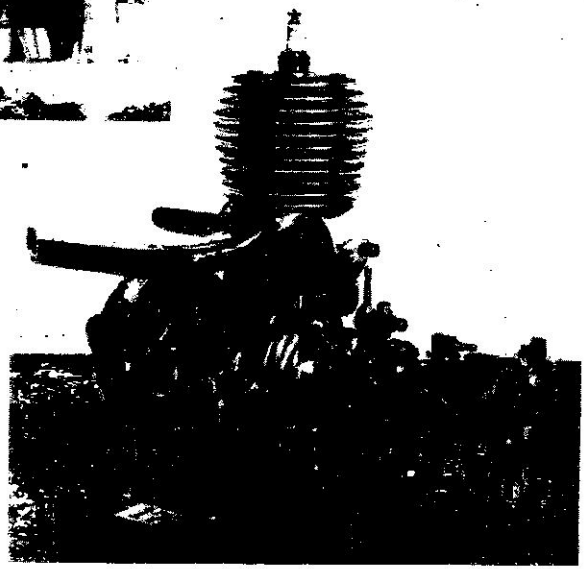
An unfinished 20 c.c. air-cooled four cylinder engine, installed in a racing car chassis, by C. W. T. Gingell

were seen in the competition section; the first, by P. J. Goodchild, was of the water-cooled monobloc type, with vertical overhead valves, operated by push rods and rockers from a side camshaft. The general design and appearance of this engine was pleasing but rather marred by a few jarring details, such as the cubist design of carburettor and the gasfitter's induction pipe.

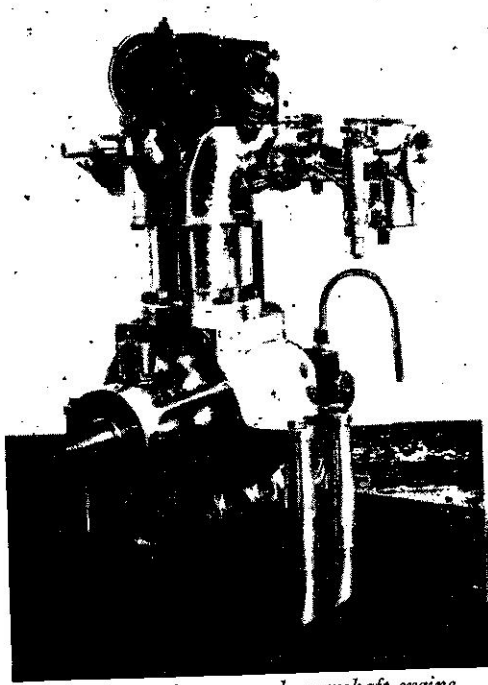
The other four-cylinder engine, by C. W. T. Gingell, was of the air-cooled type, with separate cylinders, and a single monobloc head held down by long studs. It was unfortunately shown in an unfinished condition, but is evidently intended to be equipped with an overhead cam-shaft driven by vertical shaft and bevel gearing. In its present condition, the finish and detail work of this engine leaves much to be desired. It was shown fitted to a model racing car, incomplete in respect of transmission gear.

The "Air-Oil" Engine

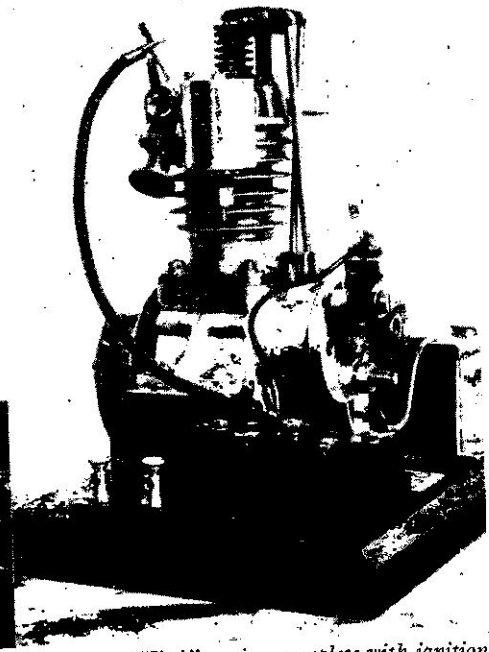
The model of a Crossley horizontal diesel engine, by Amos Barber, deserved



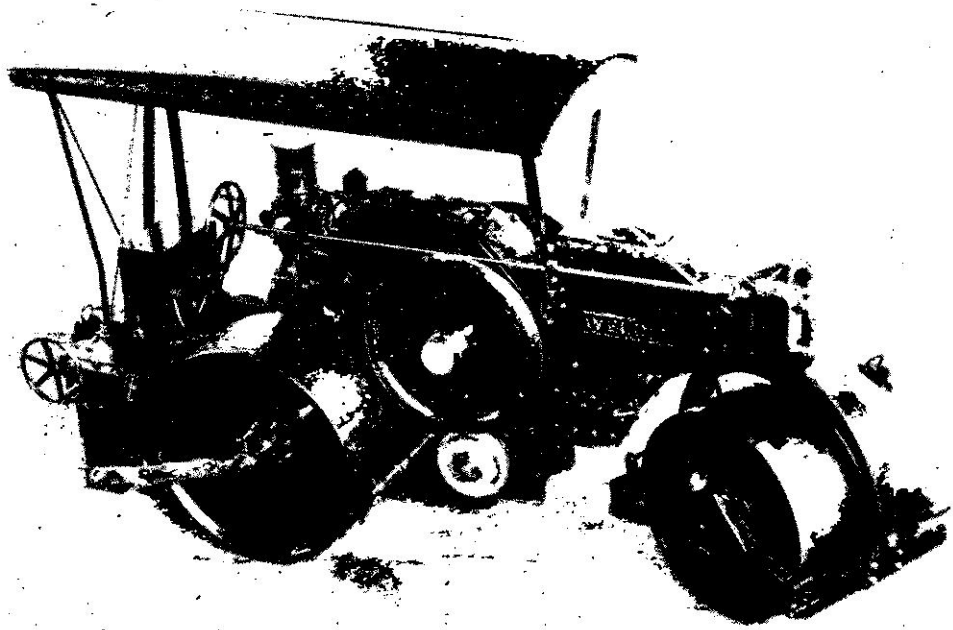
An "Atom V" engine by E. M. Thomas



C. W. Hortop's 30 c.c. o.h. camshaft engine



A 15 c.c. "Kiwi" engine, complete with ignition equipment, by H. E. Chase

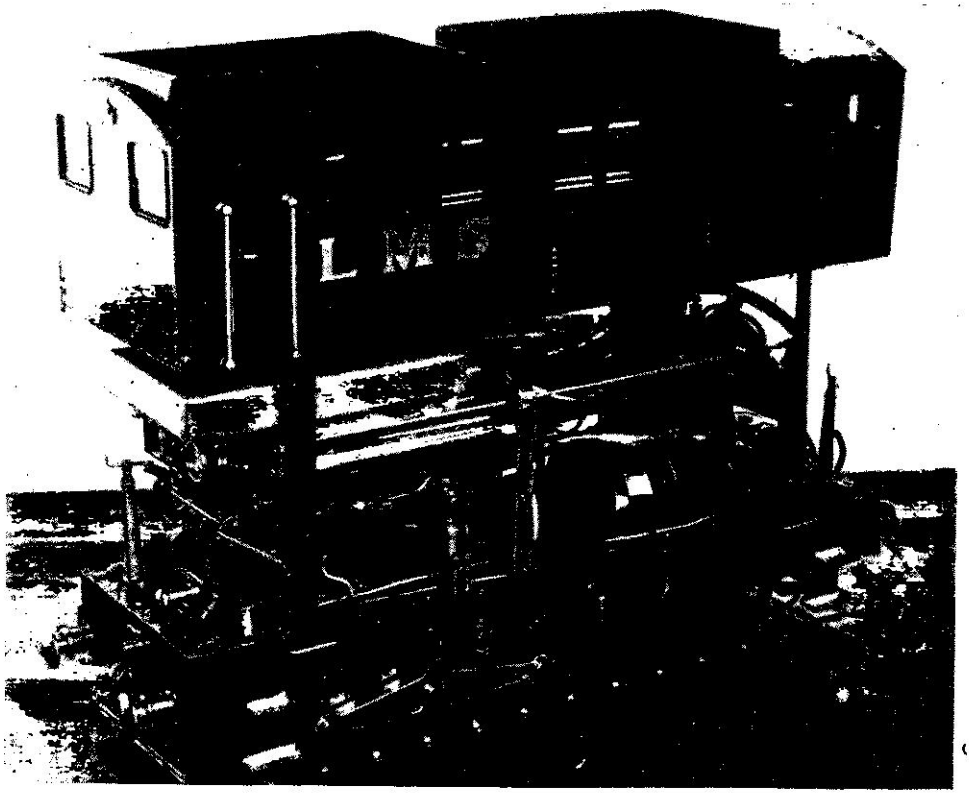


The "M.E." Aveling-type road roller, with scarifier attachment, by C. J. T. Nichols

the very highest praise for workmanship, detail and representative finish. As a true scale reproduction of the prototype, in all visible parts, it was one of the best examples in the exhibition and it would probably have ranked higher in the list of awards had it not been classed among models which were designed to *work* as internal combustion engines. This raises a very knotty controversial point, and presents competition judges with the question as to whether a model engine which works on a totally different principle from its prototype can be classed on equal terms with one in which the very different problem of reproducing correct working principles has been tackled and surmounted.

Of the engines made up to "M.E." designs, three at least deserve mention. Two of these are 15 c.c. four-strokes to the popular "Kiwi" design, by Messrs. H. E. Chase and S. F. Ramage respectively, the former being illustrated as rather the more truly representative of the type, though there is not much to choose in the workmanship and finish, or at least such of it as is visible.

The "Atom V" 30 c.c. two-stroke racing engine by E. M. Thomas, is also an example of sound practical workmanship and finish, and although the structural castings have been polished a little more highly than is usual in general practice, they are not painfully flashy.



The "1831" I.C.-engined locomotive, by W. E. Rogers

My personal views on this matter are on record, and have been very strongly criticised by some readers; but while I see no reason to change them, I should like to see this controversy thoroughly thrashed out, and would be quite content to accept the decision thus arrived at. In any case, I would like to make it clear that my remarks do not imply any criticism of Mr. Barber's excellent model, or of the policy which he has adopted in making it to work as a hot-air engine.

I have not included a photograph of this exhibit, as a full description of it appeared in the issue of THE MODEL ENGINEER for August 9th, 1945.

As seen in the photograph, the engine is complete with the "Atom" Type R carburettor, metering oil pump and contact-breaker, as recommended in the original description of the engine. Incidentally, another excellent example of this engine was shown on the stand of Vauxhall Motors Recreation Club.

"M.E." Road Rollers

There must be quite a lot of these in existence by now, and although the four shown at the exhibition (one in an unfinished condition), were excellent representative examples of the type, I was rather surprised that some of the others I

know of did not put in an appearance. No doubt transport difficulties were responsible for the default of these, and many other good models. The special prize offered by Messrs. Aveling-Barford Ltd., was well and truly won by C. T. J. Nichols, whose model, apart from being an outstanding example of good workmanship throughout, exceeded the "M.E." published design in completeness of detail, including the addition of the scarifier attachment. It is interesting to note also that Mr. Nichols had used the correct shade of green in painting this model; the rather vivid green used on at least one of the other rollers rather detracted from its appearance.

It should be noted that one of these road rollers was made by a constructor having very serious physical disabilities, which might well be regarded as presenting an insuperable obstacle to any form of mechanical craftsmanship. Nevertheless, the workmanship of his exhibit was more than creditable, and only fell short of first place in this class by reason of a few details, one of which was the use of a commercial name-plate, which tended to convey the impression that the model was a manufactured article. Incidentally, it may be mentioned that this was not the only example of work by a disabled person in the exhibition; and one hopes that this proof of the superiority of the mind over matter will give heart to those who have suffered injury through war or other misadventure, and may tend to consider that their active career has thereby been wrecked.

First Appearance of "1831"

The one example of this much-debated model, exhibited by W. E. Rogers, was an extremely creditable effort, and very complete in detail, containing several features additional or alternative to those of the original design. These included the three-speed gearbox designed by Ian Bradley, also a belt-driven air compressor (presumably for brake operation), and a neat ignition coil. The superstructure of the locomotive was shown in a raised position, supported by temporary vertical members, to render the working parts visible.

Another I.C. engine-driven locomotive, made by H. Nickolls, was also shown at the exhibition. This is extremely interesting as an experimental venture, and has already proved highly successful in hauling passengers for two seasons on the Harrow S.M.E. track and other tracks. The power plant is a single-cylinder air-cooled 30 c.c. engine, with ignition by a motor-cycle magneto, and cooled by a belt-driven fan. Transmission is by a friction gear similar to that designed for "1831," proving that this device is thoroughly practicable for its intended purpose. The chassis is 1 in. scale, and the superstructure follows the lines of the diesel-electric shunting locomotives which are gradually becoming more and more popular on railways in this country and abroad. A very neat control layout is fitted to this locomotive, and the change-speed and reverse gear is operated by a worm and nut.

Model Power Boat Engines

The most interesting I.C. engine in this section is the 5 c.c. engine fitted to the miniature hydroplane by A. L. Headech. This is of the air-cooled two-stroke type, with rotary valve admission and ignition by an "Atomag Minor" magneto, the power plant being of my design in main essentials, but considerably elaborated in detail, including a special design of contact-breaker, control quadrants for ignition and mixture, and delay-action mechanism. The entire boat weighs less than 3 lb. all-on, and in its early trials, has given distinct promise of being highly successful.

The hydroplane by R. D. Harris is apparently an enlarged version of the "M.E." 24-in. hull design, and is fitted with a 15 c.c. "Kiwi" engine; both hull and power plant are fairly typical of the type of boat favoured for competition work, and should be quite successful in practice.

At least one model power boat was rather let down by an unsuitable and inadequate engine; in this case a compression-ignition engine of Swiss manufacture, no doubt excellent in itself, but entirely out of place in a beautifully-made hull, and arranged at a very awkward shaft angle. Without doubt, a power plant really in harmony with the hull design would have gained this boat a high award.

(*To be continued*)

RUST

(*Continued from page* 330)

and, believe it or not, certain oils can behave this way. This accounts for the fact that all oils do not prevent rust. Fortunately, most good grades of oil are safe, as we know from experience. As for paper, leather, wood and the like, try not to use them for wrapping or packing unless they have been treated by oil or paint of some sort.

I have observed the above precautions in my workshop, which is only a few minutes' walk from the sea, for some four years now, and can safely leave bright steel about without fear of rust all through winter and summer.

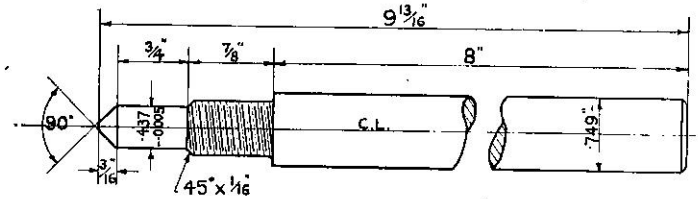
For those who may consider insulation as a remedy the details below give the equivalent thicknesses of various materials for the same degree of heat insulation; the higher the figure the worse the material. Variations of one material generally depend upon density:— Natural stones, 5-10; brick, 3-6; oak, across grain, 1; pine, across grain, 0.8; balsa, across grain, 0.4-0.5; fibre-boards, e.g. celotex, masonite, 0.3-0.4; cork slabs, 0.2-0.3; felt, 0.3; glass wool, 0.3; rock wool (asbestos), 0.26-0.28; quilting, e.g. kapok between paper, 0.24-0.26; double window, ½-in. gap, 1.0; asbestos sheet, 0.25-0.35.

A Useful Boring-bar

By F. E. Coles

THE boring-bar I am about to describe I made primarily to bore a number of 1-in. s.t.d. diameter holes 4 in. deep in some cast-iron castings. As my ordinary boring-tools chattered such a lot, I decided to make a bar as large a diameter as would comfortably go down a 1-in. hole, and a means of holding it to the top-slide. Using this sort of bar it is very easy to set the tool to centre height; also, there are no projecting tool securing screws to foul the bore.

The bar is very simple to make and there ought not to be any difficulty in getting the steel to make it. Items 1 and 2 were made from a length of $\frac{3}{4}$-in. diameter shafting. Item 1 was made first, to use as a gauge for Item 2. It was held in a three-jaw chuck set to run true in a centre steady, and faced and chamfered one end. It was then turned round held in the three-jaw and steady, again making sure that the steady end of the shaft was running true, and turned and screw-cut. The thread should have a nice clean finish, and the tip of the taper wants nicely



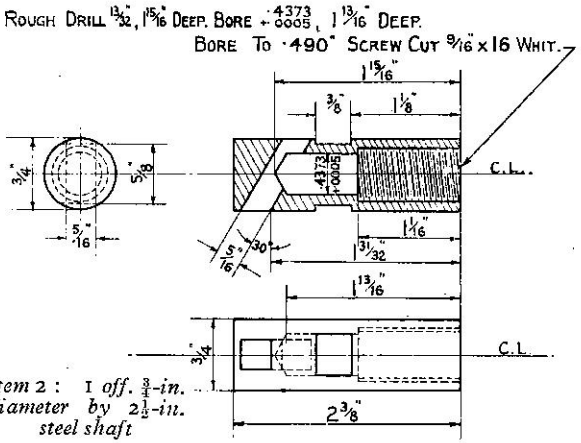
Item 1 : 1 *off* $\frac{3}{4}$*-in. diameter by* 10*-in. steel shaft*

rounding-off. The bar from the rounded tip, up as far as the thread, was case hardened, and polished to size. To finish Item 1, the diameter of the bar was polished down to 0.749 in.

For Item 2, a piece of shaft was faced up to $2\frac{3}{8}$ in. long in the three-jaw chuck. Then, holding the steel in a vice clamped to the cross-slide of my lathe, and with a $\frac{3}{8}$-in. end mill in the chuck, the two spanner flats were milled in. To save tool-bits, I used the same tools as I use in my ordinary tool-holder, which are $\frac{5}{16}$-in. square. The hole for these square tools was first drilled at an angle of 30 deg. with a 19/64-in. drill, and then opened out with a square file, so that the tools were a nice sliding-fit; it is important that the tools should not be a sloppy fit. To finish this part it was held in the three-jaw chuck, and roughed out with a 13/32-in. drill $1\frac{15}{16}$ in. deep, then opened out for a depth of $1\frac{1}{16}$ in. to 0.490 in. The 0.437 + 0.0005 diameter was bored out next, using a previously made plug-gauge of that dimension; I was now able to screw-cut Item 2, using Item 1 for a gauge. The thread and 0.437 in. diameter must be concentric on both parts to enable them to be made a standard fit.

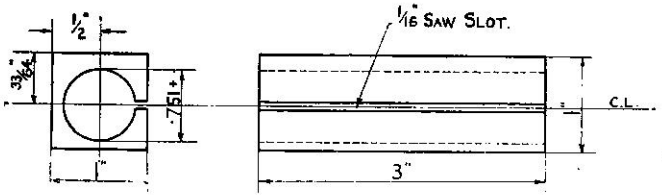
For item 3, I was lucky enough to get a piece of 1-in. square steel; otherwise it must be shaped from a piece of $1\frac{1}{2}$-in. diameter steel. In case you have to shape this part from round stock, it is advisable to drill a $\frac{11}{16}$-in. hole in the part, then work off this hole for shaping the sides. Note that the hole is a 1/32-in. off centre. After shaping, lightly hold the square of steel in the four-jaw chuck, and finish the bore to 0.751 in. +. The $\frac{1}{16}$-in. slot can either be sawn in or put in with a parting-tool on the shaper.

In use the bar is held in Item 3 and clamped to the top-slide, or, if this brings the tool too high for adjustment, it can be clamped, on a suitable piece of packing, to the cross-slide. The square tool is inserted, and secured by tightening Item 2 with a spanner: the clamps on



Item 2 : 1 *off.* $\frac{3}{4}$*-in. diameter by* $2\frac{1}{2}$*-in. steel shaft*

Item 3 are then slightly slacked off, and the bar moved round with the same spanner until the tool reaches centre height. Also, as an aid to adjustment the 0.751-in. hole is 1/32 off centre in Item 3, so that this part can be used to higher or lower the boring bar by just turning Item 3 over. In all, including the draughting of the drawing and machining of the parts this little job was completed in a total of sixteen hours.



Item 3 : 1 *off.* 1*-in. by* 1*-in. bright drawn steel bar*

L.B.S.C.'s Lobby Chat
—"*Doing the Knots*"—

SOME years ago I called the attention of the I.C. fraternity to the fact that our cousins over the pond were building little race cars, capable of speeds well over a mile a minute—actual, not "scale"—and asked them what they were going to do about it. The idea of a tiny car travelling at such a pace was ridiculed in some quarters and dismissed as "hot air from Oshkosh, Neb.," until chapter and verse were forthcoming, and then our own fans got busy and found out that a little car actually *could* be made to travel nearly as fast as its full-sized relations. In fact, they now have a journal all of their very own. Well some of our own fraternity (F.C.—firebox combustion ?) are asking if it is possible for little locomotives to approach the speeds of their big sisters in like manner, in view of the fact that continuous roads with wide radius curves are being installed in various parts of the country. Let's do a little simple analysis.

Mr. L. G. Tucker's "Terrier" keeping up Brighton Tradition

First of all, take the mechanical aspect. The little cars are powered by two-stroke engines (cheers from Mr. Westbury !) in the majority of cases, and the drive is direct ; also the cars haul no load. Now everybody who knows anything at all about gasoline motors, doesn't need reminding that these amazing pocket plants turn over at several thousand revolutions per minute, and keep on doing it—the spark plugs certainly have a real hot time, and earn their keep !—so that with the driving wheels of the car turning at the same speed, and only the light weight of the car, plus air resistance to overcome, the rate of travel is fully accounted for. There is little or no back pressure, the exhaust escaping through either an open port or a very short exhaust pipe of same or larger cross section. The cars are built with one object in view, and one only, viz., Speed, with a capital S.

The steam locomotive is a different proposition. Whereas in the I.C. engine, the power is generated in the cylinder itself, literally "in a flash," in a steam locomotive it has to be generated in a separate boiler, led to the cylinders by pipes, and admitted and exhausted by valves. It takes longer for steam to enter the cylinder and build up to working pressure on the piston head, than the explosion in the I.C. cylinder. Also you cannot have a direct exhaust to the open air, as the steam is utilised to produce a draught for the fire, and so must be led to the blast pipe. I would not go so far as to say that a steam engine could not be made to turn just as fast as an I.C., but it would need a high boiler pressure, and a boiler capable of supplying a larger quantity of steam than is possible with the biggest and most efficient boiler ever installed on a locomotive of given size. Therefore, it is easy to see that even with an engine of 100 per cent. efficiency, having big steam and exhaust pipes, big ports and valves, properly designed and timed valve gear, and other essentials, the factor determining the maximum speed of the engine, for doing a spot of record breaking, would be the ability of the boiler to supply the necessary steam at the given pressure.

The steam locomotive has one small advantage, inasmuch as it drives its wheels direct ; but against this, it has to be much heavier in construction, as the frame takes the driving stresses, as well as carrying the weight of the boiler and mechanism. The car frame has only to carry weight and transmit the torque ; all driving stresses are in the self-contained motor. The working parts of the locomotive are too well known to followers of these notes, to need any detailing ; against them, the I.C. two-stroke has only a piston, connecting-rod, and crank—eh, what's that ? Why, bless your hearts and souls, I told you all long ago that we had an Atco lawn-mower ! Taking everything into account, I don't think that a little steam locomotive could spin its wheels at the revolution speed of an equivalent gasoline motor.

Race Track v. Rail Track

One facetious correspondent asked when was I going to put a small locomotive on the track, that would do its mile a minute ? My reply to that was, that it wouldn't be the slightest use, as she wouldn't stay on the track long enough to do a quarter-mile, let alone a full one ! At first the race-car fraternity knocked up their records with their cars at the end of a string, tethered to a pole, running around the pole in speedboat fashion. Later, they constructed regular racing tracks, with rails or grooves for the car wheels, and high-banked curves, like full-size race

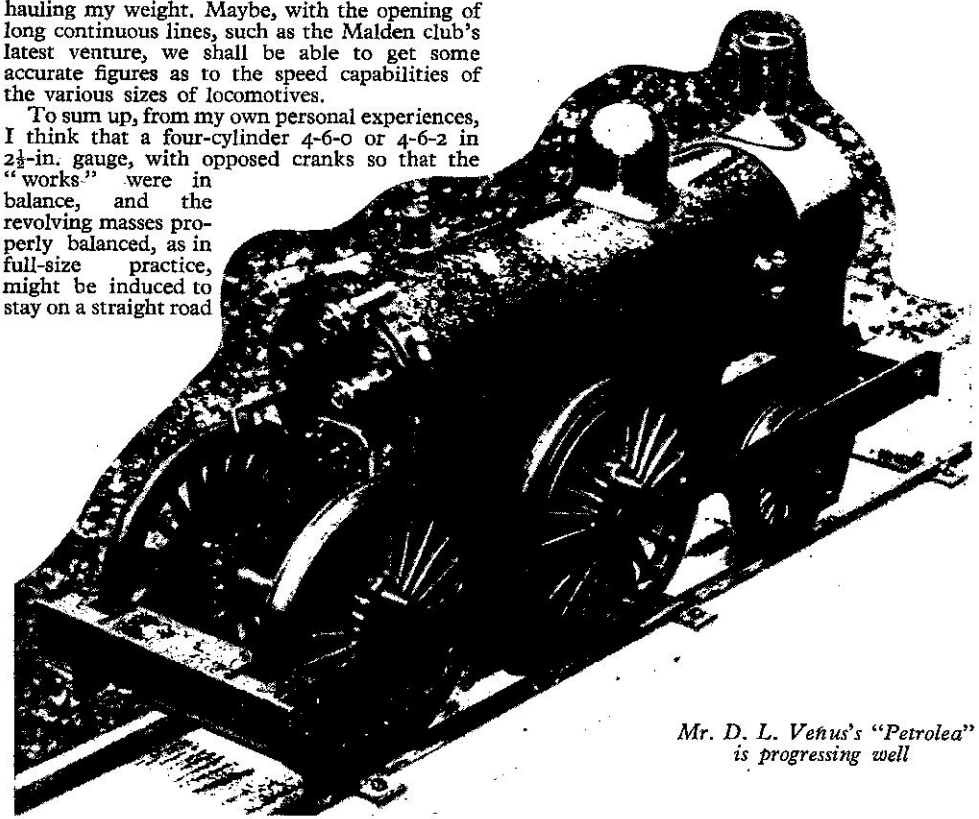
tracks. You can't do things like that with a little railway; all that can be done, is to have the alignment exact all ways, the curves of the widest possible radius, and the maximum permissible amount of superelevation. It isn't much good deepening the wheel flanges, because that would only increase the friction on curves.

As to what has actually been done in the way of speeding on little railways, I have no "official" records, except that of just over ten miles per hour by Mr. S. H. Carr's 2½-in. gauge "Fayette" type 4-6-2 on the old line at Romford. One of the engines I built, also a 4-6-2, was let all out, running light, by its owner on a bit of straight road, on which it accelerated like a streak of greased lightning, promptly jumped the rails, and went through a wooden fence composed of feather-edge boards. The buffer beam was bent, and the smokebox front damaged, otherwise she came out very well. The owner said he tried to take the time with a stop-watch over a measured distance, which ended at the "scene of disaster," as near as made no odds, and estimated the speed at over sixteen miles an hour when she "took to the air." Mr. Carr's engine would easily have attained the same speed running light; she was hauling his weight when she made the record mentioned above. Any of the locomotives in my present stud, except, perhaps, the 4-12-2 "Caterpillar," would easily overrun the limit at which she would stay on the road, even when hauling my weight. Maybe, with the opening of long continuous lines, such as the Malden club's latest venture, we shall be able to get some accurate figures as to the speed capabilities of the various sizes of locomotives.

To sum up, from my own personal experiences, I think that a four-cylinder 4-6-0 or 4-6-2 in 2½-in. gauge, with opposed cranks so that the "works" were in balance, and the revolving masses properly balanced, as in full-size practice, might be induced to stay on a straight road or very wide radius curve, at about 25 miles per hour; but I doubt if she would do so above that speed. Even a rail-joint slightly out of alignment, would cause a wreck. Larger and heavier engines, would, of course, travel faster in proportion; I fancy a 15-in. gauge "Tugboat Annie" on the Romney line could do a mile a minute. However, in the small sizes, and on my own line with its 17 ft. 6 in. radius curve at the south end, I've too much respect for my engines, to try any record-breaking stunts!

The Railway at Riddlesdown Fair

The photograph of a "fair" railway, sent by Mr. A. S. Connor, and reproduced on page 188 of the issue for August 22nd last, certainly doesn't illustrate the little railway mentioned in the reminiscence of my Bank Holiday ramble to Riddlesdown, in the far-off days of my childhood. I recollect most of the details quite well. There was no framework of the roundabout kind, building, tunnel, or anything else; the rails were flat-bottomed, rather light, and fixed direct to small steel sleepers, the whole issue being put together on a level bit of grass-covered ground, just like a kiddy would lay out a gauge "O" circle on the kitchen floor. The circle would be about 150 ft. diameter. There was a "platform" composed of builder's scaffolding planks raised just off the ground on bricks, and a girl



Mr. D. L. Venus's "Petrolea" is progressing well

at one end took the children's half-pennies and regulated the "queue" of waiting passengers. At the same end was a pile of coal, and a water-tank propped up on a framework similar to the one I have on my own railway at the present time. I can see the whole outfit in my "mind's eye" now, as clearly as the day I saw it in reality; it is curious how some things are impressed on one's mind. As there was no fence, people walking about the fair simply stepped over the rails, same as you cross the tramway track in a street, merely looking to see if the train was coming. If the driver saw anybody attempting to cross as the train approached, he blew the whistle, which was a fairly shrill one, something like that on the London Chatham and Dover engines. I crossed the track and took up a position, half lying and half sitting, opposite where the engine stopped. I longed to speak to the driver, but shyness had settled well down on me that day. He was a pleasant-looking man, with a very red face and a grey moustache; not a gipsy, but somewhat like my friend of the Borough Council steam-roller—sorry, that is a slight error! There was nothing so swanky as "Borough Council" in those days, they called it "vestry." Anyway, I hoped that maybe he would "break the ice"; alas, he didn't. If he noticed me at all, my mop of curls, and my small shoes, probably gave him the impression that I would be more interested in dolls than engines, despite my threadbare cotton sailor blouse and knickers. So I just watched!

A 2-2-2 Type

I have made a sketch of the locomotive, and you will see that it is vastly different to the one shown in Mr. Connor's picture. It was a 2-2-2 with a huge pair of driving wheels with very spidery spokes; and the first thing Curly spotted was the very short stroke of the cylinders, the crankpins being very close to the wheel centres. The boiler was of small diameter, easily fitting between the wheels. The smokebox was waisted in at the bottom, and carried a straight stovepipe chimney with a heavy bead around the top. I recollect that detail quite well, as all the stove-pipe chimneys I had hitherto seen, on Great Eastern, L.S.W.R. and other engines, had a tapered barrel and a narrow bead. The tall dome carried a single spring-balance safety-valve. There was another direct-acting valve over the firebox, with an open spring held down by a crossbar on two small studs; I figured that at some time or other, this valve had been covered by a brass casing like the G.N. or Midland engines had, and it had probably got lost.

The driving-wheel splashers were fully open, exposing the whole wheel, and were edged with polished brass beadings. There was no cab, merely a weatherboard with side fenders. The driver sat on the low-sided six-wheeled tender, which did not carry any coal, as he filled the available space. Firing was done, when needed, whilst the kiddies were getting on and off the train. The driver filled up the tender tank by a hose attached to the before-mentioned stationary tank, and the water was fed to the boiler by an eccentric-driven pump underneath. I recognised the pump, as the steam-roller had one, only that was diagonally arranged, the one on the little engine being horizontal. The engine was painted dark green, and was nice and clean; she had the usual black smokebox and frames and red buffer-beams. There was no lettering or number.

The train consisted of three four-wheeled wagons, with seats across each end, on which a couple of kiddies could sit side by side; but there were such a lot of them, that the girl in charge was letting the larger children stand two or three at a time, between the sitting riders. The engine started very slowly, with loud exhaust beats, but I did not see any slipping, and the kiddies got a good half-pennyworth, for the train went around about five or six times on each trip, the driver giving a long blast on the whistle as they approached the "station," and the riders cheering loudly and waving to the waiting passengers as the train went through without stopping. Speed on the run was about eight or nine miles per hour, as children who had been riding frequently tried to race the little engine when their friends were aboard the train, but seldom managed to keep pace with it. I might mention here, that children in those days were not so reckless, or mischievous, as those of the present generation. They kept well clear of the track, and did not attempt any silly antics like dashing across in front of the engine, lying down with their ears to the rails, or putting stones and other obstructions on the rail heads; all of which, plus many other dangerous and mischievous things, were done at Danson Park when Mr. R. C. Hammett operated a 9½-in. gauge line there during the war period, whilst the "Holidays at Home" stunt was in vogue.

Young Curly was sorry to bid *adieu* to the little railway, but evening was coming on, and he wanted a cup of tea and a cake before walking back to East Croydon Station, to get a train for home. Not for all the world would he have broken his promise to be home by a stated time, and thereby caused his mother any anxiety. That, plus his standing promise always to keep out of trouble and danger, was why she let him go wherever he wished, without restriction, let or hindrance. Well over half-a-century has passed since that day, and Curly has travelled many hundreds of thousands of miles by rail, sea, and road; yet, even as I write these words, on a sunshiny morning, the loud exhaust beats of a 2-6-0 hauling a goods train up the bank through Riddlesdown Station, can be heard plainly through the open window; and they suddenly die away as she enters the tunnel. Truly, 'tis a small world!

The Old Order Changeth!

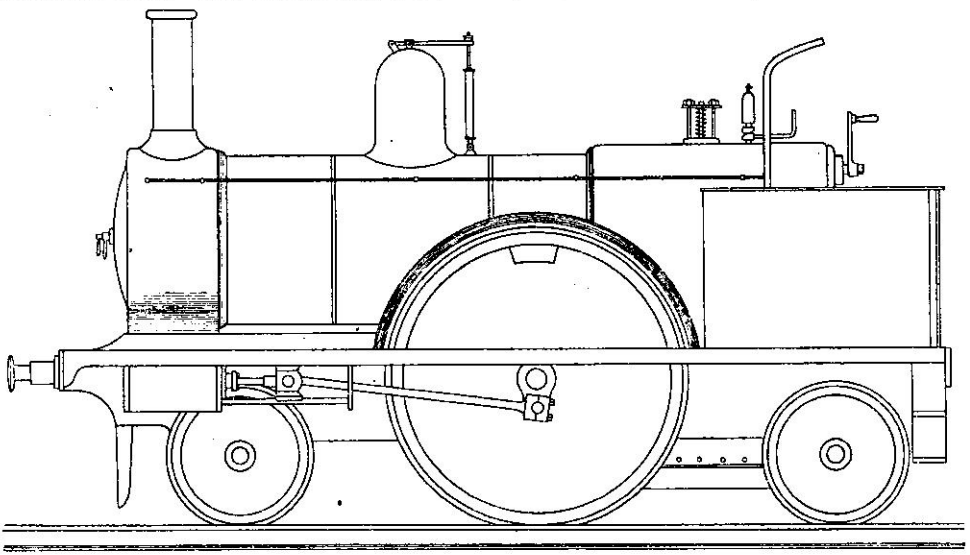
Some recent correspondence with full-size enginemen on the subject of general locomotive efficiency, brings to mind a statement made by the C.M.E. of the Southern Railway not so long ago, which may cause many firemen to scratch their heads and ponder a little! A member of the Institution of Locomotive Engineers, Mr. E. S. Cox, who is well versed in modern locomotive development on the L.M.S., read a paper describing the locomotive history of

that railway during the first ten years of grouping. I need not go into details here, as readers of these notes, who also follow technical journals, such as the *Locomotive Magazine*, the *Railway Gazette*, and so on, will have seen the report and extracts of the said paper, in those journals ; suffice it to say that by far the most interesting part of it, was the description, plus illustrations, of the several designs proposed, but not built. In fact, I have received several letters suggesting that a few notes be included in this series, indicating how the "ghosts" could be brought to life in 3½-in. or 5-in. gauge, as a memento of what "might have been" on the L.M.S., if Sir W. A. Stanier hadn't Great-Westernised it.

However, in the paper, the author described how, by use of high-degree superheating, long-travel valves, improved valve-gear and other expedients, the coal consumption of the engines had greatly decreased ; and considered this a great improvement. Your humble servant is in hearty agreement, and personally I don't know of a solitary engineman who isn't ; but in the discussion which followed, the C.M.E. of the Southern said that his own view was that a locomotive was intended to burn coal, and the more coal that an efficient engine burned, the better ; it meant that she was doing more work. On quoting this to one of my correspondents, who is an engineman on the S.R., that worthy said that the gentleman certainly practised what he preached, for the "biscuit-boxes" on the Kent coast line were burning 7½ tons of black diamonds on the return trip, from Ramsgate to London and back, as against an average of 4 tons for the "Schools" class!

Well, I'm not making any comment on it ; whether the engines in question are earning their "little bit of corn" (accent on the "little") is the railway company's pigeon ; but from the point of view of an old-time engineman, it seems that the pendulum has swung completely over. Mr. Bulleid also added that the management might usefully ask why an engine was burning so little coal, instead of so much. Stroudley's engines were efficient, and burnt little coal ; he it was, who initiated the idea of paying the drivers and firemen a premium every month for all coal saved over a specified allowance, viz., 17 lb. per mile for the engine, plus 1¼ lb. for every two axles in the train. To the credit of his successor, Bob Billinton, that worthy carried it on, although his engines never made much of a showing in the "coal money" list, which was also considered a good indication of the efficiency of the engine crews, as well as the locomotives themselves. Can anyone imagine what would have happened if Driver Jones and Fireman Smith had suddenly been summoned to appear before the Board of Directors, on the heinous crime of being top of the coal premium list for twelve months on end?

In connection with that, here is a true "coal-money" yarn. Driver A, in charge of a "D"-class tank, consistently ran on his engine allowance, and took nothing for the coaches. His engine was pulled to bits at Brighton, and examined thoroughly to find out why, but she seemed no different from the rest, and the matter remained a mystery until he retired. Then he spilled the beans. A certain amount of coal was naturally spilled when loading, and the "coalies" shovelled it up and put it in a skip. As it contained cinders, ballast, and all sorts of "foreign matter," it would not have been fair to book it out as coal allowance ; and if any driver cared to take it, it wasn't booked up to him. Driver A, being a master of his craft, with an engine in first-class fettle, tipped the "coalies" to save him all the "muck," and the result was as described above. It was perfectly legitimate ; but how many modern drivers could do it—and how many modern engines would steam so well on the contents of a skip of "muck?"

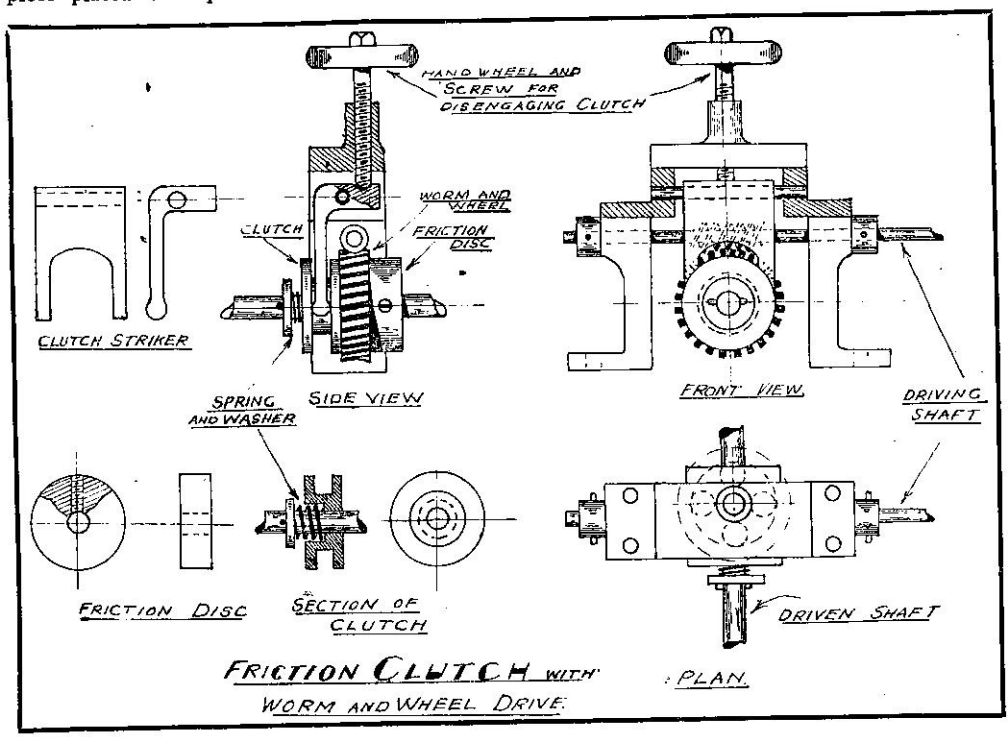


A memory sketch of the Riddlesdown Fair engine.

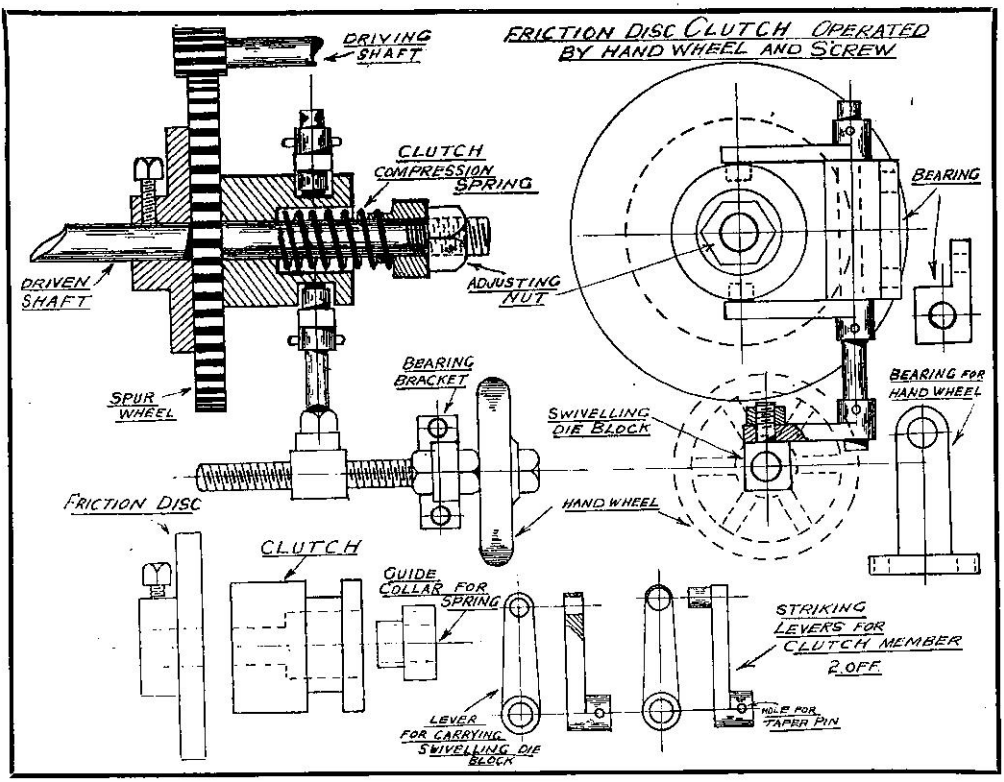
Model Clutches

By T. W. Geary

THESE two clutches herewith described have been made by the writer and fitted to models; the first, with worm and wheel drive, is attached to a small turbine-driven steam winch, allowing the turbine to run free if desired. The other clutch, driving through spur wheel and pinion, is geared to a service pump connected to a single-acting high speed steam engine, which can be disengaged from pumps. Both of these clutches are of the friction-type, the friction plate is turned from ordinary brass, and the gear wheels are held solid between friction plate and clutch member by the action of the spring. There has never been any slip on either of these clutches when in operation, therefore it has not been necessary to use fibre substance for obtaining the grip. I have not given any dimensions on sketches as these clutches can be made to different sizes to suit requirements. There are quite a variety of purpose these clutches can be used for in model and small power work, they are quite an interesting unit to make up. The clutch of the model steam winch is a small unit but quite effective. The worm wheel is $\frac{3}{4}$ in. diameter, and the clutch member is $\frac{5}{8}$ in. diameter. The worm and shaft are mounted on two brass bearing brackets, and a brass bridge-piece placed on top is screwed to same for carrying the hand wheel and screw for operating the striker. The striker is made in steel, and the forks are rounded off at the ends and swivels between bridge-piece, as shown on sketch. The handwheel is turned from brass rod and is $\frac{5}{8}$ in. diameter, the screw is $\frac{1}{8}$-in. Whit. The clutch member is turned and grooved for striker, drilled through for spindle and counterbored for spring. The spring is held in position by a steel washer and taper pin. The friction disc is turned from brass rod drilled for spindle and fitted with set-screw. The method of disengaging clutch by the handwheel is shown on sketch. The clutch attached to high speed engine and pump is fitted with spur wheel and pinion, the spur wheel is held by friction between the disc and clutch member by the action of a fairly strong spring, which is made adjustable by screwed nut on spindle. The friction disc is $1\frac{1}{2}$ in. diameter and made in brass, this can be made in steel if desired. The clutch member is $\frac{7}{8}$ in. diameter, drilled through for spindle after turning and counterbored to house the spring; the striking arrangement differs from the one just described. Two arms or levers are pinned on the spindle, and made from square steel rod. These operate the clutch through the action of the handwheel and screw, attached to a swivelling die-block



FRICTION CLUTCH WITH WORM AND WHEEL DRIVE.



fixed to arm pinned on the other end of spindle, The spindle is supported by a long angle block bearing, as shown on sketch. The wheel and screw has only one main bearing near the hand-wheel. The support of the screw is taken up by the die block and lever. A guide collar is made in steel or brass and turned with a shoulder for fitting spring and drilled for spindle. Both these clutches function quite well, and should be useful for power-driven boats.

Mounting Water Gauge Bushes Parallel

THIS indispensable condition of parallelism, easy of attainment on a truly flat surface, becomes a different matter, e.g. near the edge of a boiler backhead where the plates curve (Fig. 1). From mild-steel rod (Fig. 2) make two bush plugs to screw into the bushes, flush to shoulder. The top spigot is screwed to any convenient diameter, and the two plugs are secured by nuts to a steel strap (Fig. 3); the holes in strap being the distance apart it is desired to mount the bushes. At this distance, the holes for the bushes are then bored in the boiler plate, the whole fixture placed in position and the bushes soldered in place with fillets around their flanges. When cold, the strap is removed and the plugs screwed out of the bushes. This method is applicable to any uneven surface because it always keeps the bush-holes dead parallel during the soldering operation, the whole affair being rigidly held by plugs and strap until the solder has set hard.

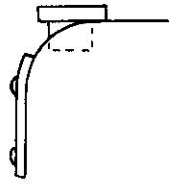


Fig. 1

Fig. 2

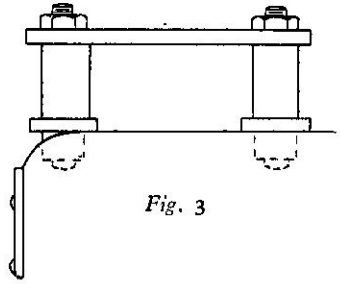


Fig. 3

—W. BIRCHENOUGH.

Clubs

Mancunian Model Engineering Society

Make a date with the "Mancunians" next Friday evening. Interesting talks and lectures. Winter programme now in full swing. Meetings each Friday evening at 8.0 p.m., in our room at the Girls' Institute, Mill Street, Ancoats. Visitors and lone hands welcomed.

Hon. Secretary: J. MEADOWS, 90, Bank Street, Clayton, Manchester 11.

Burnley and District Model Engineers' Society

The next meeting will be held on Friday, October 4th, at the Church Institute, Manchester Road, Burnley, at 7.30 p.m. At the last meeting held at Burnley, 25 members attended and all went on a visit to the Burnley Automatic Exchange, and learnt a lot by it. There will be a lot of these kind of visits this winter.

Joint Hon. Secretaries: Mr. J. D. MEE, 2, Windsor Avenue, Church, near Accrington; and Mr. A. BATEY, 36, Moseley Road, Burnley.

Worcester Model Engineering Club

At the inaugural meeting held at the Bridge Inn, Bridge Street, on September 12th, it was decided to form a Model Engineering Club in this City. The meeting was very well attended, and indeed it was surprising to find such an amount of talent. Interests were very varied, ranging from model locomotives, petrol engines, ships, race cars, to general model engineering.

It was arranged for the next meeting to take place at the Bridge Inn, Bridge Street, on Thursday, October 3rd, at 7.15 p.m.

Hon. Secretary: F. L. FUDGER, 23, Camp Hill Road, Battenhall, Worcester.

The Bolton and District Society of Model Engineers

The next meeting of the above Society will be held on Tuesday, October 8th, at 7.30 p.m. It will take the form of a "Bits and Pieces" evening, and members are asked to bring along whatever they consider will be of interest.

Hon. Secretary: A. H. BOOTHROYD, 113, Hilton Lane, Little Hulton, near Bolton. Tel: WAL 2352.

York City and District Society of Model Engineers

Next meeting, October 5th, at No. 11 Room, Co-op. Hall, Railway Street, York, at 7 p.m. sharp.

Will all members intending visiting Hull, on Sunday, October 6th, please make a special effort to be at this meeting. Starting time at Hull is expected to be 2.30 p.m.

Hon. Secretary: WILLIAM SHEARMAN, 28, Terry Street, York.

The Welling and District Model and Experimental Engineering Society

The forthcoming fixtures of the above Society are:—October 5th, Committee meeting; 6th, Boat meeting, Blackheath. For further details enquire of the Secretary, Mr. W. Dixon; 11th, "Storage Batteries"; 19th, Juniors' Night; 25th, it is hoped to arrange a film show on this evening.

November 8th, "Small Gauge Railways"; Mr. Patterson; 16th, Juniors' Night; 22nd, Quiz; 30th, it is hoped to get Mr. Court along on this evening to give a talk on Miniature Diesel Engines.

The Junior Institution of Engineers

Friday, October 4th, at 6.30 p.m., 39, Victoria Street, S.W.1, Informal meeting. Discussion Groups. "Low Temperature Insulation," to be opened by A. Cooper.

Western Group of Members—Friday, October 4th, at 7.30 p.m., Merchant Venturers Technical College, Unity Street, Bristol, Annual General Meeting.

Friday, October 11th, at 6.30 p.m., 39 Victoria Street, S.W.1, Ordinary meeting. "Engineering Aspects of Atomic Energy," by Dr. H. Chatley (Member).

North Western Section—Monday, October 14th, at 7.0 p.m., Manchester Geographical Society, 16, St. Mary's Parsonage, Manchester. Annual General Meeting, followed by Presidential Address. "Light and Colour," by L. H. A. Carr, M.Sc. (Tech), M.I.E.E., A.R.P.S. (Member).

Sheffield Section.—Wednesday, October 16th, at 7 p.m., Meeting, in Lecture Room of Leeds University, "Steel and the Engineer," by A. Roebuck (Member and President, Sheffield Section).

Friday, October 18th, at 6.30 p.m., 39, Victoria Street, S.W.1, Informal meeting, "Atmospheric Railways," by L. P. Walter (Member). Slides.

Sheffield Section.—Friday, October 18th, at 7 p.m., Annual General Meeting, Metallurgical Club, West Street, Sheffield. "The Schneider Air Contests," by E. Scott.

Friday, October 25th, at 6.30 p.m., 39, Victoria Street, S.W.1, Informal meeting. "Water Pumping Machinery," by H.K. Hewitt (Member). Slides.

Friday, November 1st, at 6.30 p.m., 39, Victoria Street, S.W.1, Discussion Groups. "High Temperature Insulation," to be opened by R. L. Ballard (Assoc. Member).

Western Group of Members.—Friday, November 1st, at 7.30 p.m., Merchant Venturers Technical College, Unity Street, Bristol. "Geology in Engineering," by F. L. Daniels, M.I.Mech.E., F.G.S. Slides.

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The Editor invites correspondence and original contributions on all small power engineering and electrical subjects, which should be addressed to him at 23, Great Queen Street, London, W.C.2. Matter intended for publication should be clearly written, and should invariably bear the sender's name and address.

Readers desiring to see the Editor personally can only do so by making an appointment in advance.

All correspondence relating to sales of the paper and books to be addressed to THE SALES MANAGER, Percival Marshall and Co. Ltd., 23, Great Queen Street, London, W.C.2.

Correspondence relating to display advertisements to be addressed to THE ADVERTISEMENT MANAGER, "The Model Engineer" 23, Great Queen Street, London, W.C.2.

"THE MODEL ENGINEER"
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Minimum charge, **3/-**

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Buck and Ryan's Department for Lathes, Drilling Machines, Grinders, Electric Tools, Chucks, Surface Plates, Lathe Accessories and Tools.—310-312, Euston Road, London, N.W.1. Telephone: EUSton 4661. Hours of Business: 8.30 to 5.0 p.m., Monday to Friday; Saturday, 1.0 p.m.

Split Chucks for Watchmakers' Lathes, 6 mm., 6½ mm., and 8 mm., at 7s. each, postage 6d.—JOHN MORRIS, 64, Clerkenwell Road, London, E.C.1.

Infinitely Variable Speed Gear, ratio 16 : 1, materials supplied, leaflets—CROWTHER, 85, Charlotte St., Rochdale.

"Little John" Lathes. Sole Selling Agents for Home and Export. Send for illustrated literature and orders to—THE ACORN MACHINE Tool Co. (1936) LTD., 610-614, High Road, Chiswick, London, W.4. Telephone: CHIswick 3416-7-8-9.

Bargain Prices—Clearance workshop surplus, useful assortment unused H.S.S. drills, milling tools, reamers, taps, centring drills, gauges, lathe cutters, etc. Fully guaranteed. S.A.E. full details, bargains.—Box No. 4134, MODEL ENGINEER Offices.

Wanted, Bench Milling Machine. State maker, dimensions, accessories, moderate price. One needing repairs considered.—5, Cadogan Road, Surbiton, Surrey.

Wanted, Steam Plant for metre destroyer hull, single screw. Must be in good condition.—WALKER, Tillington Old Rectory, Petworth, Sussex.

4½" B.G.S.C. Lathe. Countershaft and 240/1/50 Motor. Complete with stand and chip-tray, chucks, faceplate, and accessories, £35.—E. P. NUNN, 187, West End Road, Ruislip.

"Atlas" Lathe Users. Please note we are in the position to supply Chip Trays from stock, 46" long × 10" wide × 1½" depth with ¾" turnover on edge, 20-gauge steel, painted standard Atlas Grey. At each £1 10s. Please add the following for carriage:—One tray, 2s. 6d.; two trays, 3s. 9d.; three trays, 5s. Orders to Sole Agents:—THE ACORN MACHINE TOOL CO. (1936) LTD., 610, 612, and 614, High Road, Chiswick, London, W.4. Telephone Nos. Chiswick 3416/7/8/9.

Contents of Model Engineer Shop For Sale. Owner going abroad. Includes power driven lathe, electric grinder, large bench, large quantity hand tools and material; brass sheet and rod copper and steel in many sizes; also screws and nuts. Bucks area.—Box No. 4142, MODEL ENGINEER Offices.

Wanted, 5" Atlas Lathe with power cross feed. Good price paid for good machine.—HADLOW'S GARAGE LTD., Bromley, Kent. Rav. 2273.

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Sale, Bench Miller, nearly finished, 12" × 3½" table, together with patterns, £5. S.A.E. for full particulars.—WOOD, 1, East Road, Gorton, Manchester.

3" George Adams B.G.S.C. Lathe, faceplate, 3-jaw and 4-jaw chucks, change-wheels. Price £10. Buyer collects.—BRACKLEY, 5, Red Road, Brentwood, Essex.

Disabled Ex-Serviceman Requires 3" to 3½" B.G.S.C. Lathe, with 4-jaw chuck, also treadle wheel to suit same. Limit £10.—Box No. 4149, MODEL ENGINEER Offices.

Sale or Exchange, 4" bore × 6" stroke "National" Gas Engine. Buyer collects.—JAMES DRABBLE, 9, Allerton Road, Woolton, Liverpool.

Wanted, B.G.S.C. Lathe and accessories, complete on stand with treadle. Particulars to—PLUMMER, 3, Prospect Place, Rippleside, Barking, Essex.

Hand Planer, Toolside Missing, Table, 12" × 6", M.E. Grinder, F. & L. alternative twin V, Crompton Parkinson ½ h.p., 1 phase, repulsion induction Motor. Lot £13.—29, Manor Close, Kingsbury, N.W.9.

Ward Horizontal Miller, table 11" × 4" solid steel, T-slotted, travel 6½". Completely re-conditioned, including newly ground spindle, mounted on cast iron pillar stand, with suds tray. Ideal machine for locomotive work, £25.—CARTER, 10, Shipperbottom Lane, Ramsbottom, Lancs.

Wanted, "Super Adept" Lathe. Good condition.—NEVILLE, 14, Grange Hill, Edgware, Middx.

Many Additional Items. New lists gladly sent. Aluminium sheet, 20" × 6½" × ⅛", 3s. 6d. sheet; Copper snap/Cs. rivets, 3/32" × ¼", 1s.; 3/32" × ⅜", 1s. 3d.; 3/32" × ⅛"-¼" × ⅜", 1s. 6d. gross; ⅜" iron rivets, 6d. gross; Lodge plugs, 5s. each; Taps to suit, ex-stock; ⅜"-1" bore plummer blocks, 4s. 6d. each; 3/32"-¼" Whit. 4, 5, 6, 7, 8, B.A. CH/Cs. screws, ⅜"-½", 2s.; ¾"-1", 2s. 6d. gross; Brass plus 3d. gross; Hexagon full nuts turned from bar; Steel, ⅛", 4, 5, 6-B.A., 3s. 3d.; 7, 3s. 9d.; 8, 4s. 3d.; 9, 5s. 6d.; 10, 6s.; Brass, ⅛", 4, 5, 6-B.A., 2s. 6d.; 7, 8, 9, 10-B.A., 2s. 9d. gross; full range steel and brass fine screws; Steel and brass sections; Boiler fittings and castings; Easy-Flo; B6 alloy and other silver solders, from 2s. 3d. oz. Cash with order or C.O.D.—A. J. REEVES, 81, Cole Valley Road, Birmingham 28.

3" "Ideal" Bench Lathe, gap bed, Compound slide rest, back-gear, hollow mandrel, facepl ate, catch-plate, bought 1936, unused, perfect. What offers?—Box No. 4147, MODEL ENGINEER Offices.

Air or Oxygen Tanks, suitable for compressors, size 14" × 7", screwed nozzle, tested 2,000 lb., weight 10 lb., 10s. each, carriage paid.—N. R. BARDWELL, 473, Abbeydale Road, Sheffield.

Wanted, Hand Shaper, 8" stroke, Atlas No. 1 or 2 preferred. Good price offered, but machine must be in good condition. Details and price.—CLARK, Isla Cottage, Isla Road, Perth.

Wanted, Grinder and Polisher, 230 v. A.C., 56 lb. Anvil.—TURNER, 3, Victoria House, High Road, Goodmayes, Essex.

Grinder, 3" Lathe, compound slide, new condition, with chucks, tools, drills, double end 230/1/50 motor driving both, £50.—42, Westway, Heston, Middlesex.

Quantity H.S.S. Drills, number and 1/64" sizes up to ½", about 250, half pre-war price, brand new; one 12" universal Scribing Block with dial indicator, 70s.; 3 A.C. single phase, 220 volt, 50 cy. Motors, ¼ h.p., new, £8; ¼ h.p. squirrel cage double ended shaft, £5; 1 h.p. repulsion induction, £10; 5" plain metal Lathe, 2' 6" between centre, No. 2 M.T. centres, fitted 4" S.C. and 6" ind. chucks, compound slide rest, V-bed, sliding tailstock, countershaft, pulley, 4 step, 1¼" belt, but no stand, £18.—EVANS, High Street, North Tawton, Devon.

Wanted, Small Lathe, also ¼, 1/3, or ½ h.p. 230/1/50 A.C. Motor. For sale, ½ h.p. 240 D.C. Motor, £3 10s.—136, Tolworth Road, Surbiton, Surrey. Elmbridge 5019.

24 Volt D.C. Motor, with flexible shaft, 50s., new; adjustable light Brackets for lathes, etc., 20s. each; Lathe centre No. 4 M.T., H.S.S., new, 8s.; two 6" Pulleys, 3½" face, 1" bore, 5s. ea.; one 4" ditto, 1¼" bore, 4s. 6d.; two flywheels, 27" diameter, 1½" bore, 60 lb., 20s. each; Pocket Telescope, 8s. 6d.; used tool bits, ⅜" and ½" H.S.S., 1s. each; 12 copies "Popular Mechanics," 40s.; ½" End Mill, No. 2 M.T., new, 20s.; ½" Reamer, 7s. 6d., new; Tool Post for 3½" to 4½" lathe, nearly finished, 20s.; Fretsaw Frame, 7s. 6d.; 7" × 2½" Grindstone, in iron trough, 20s.; 2" gap bed centre Lathe. What offers? Wanted, three- and four-jaw Chucks, 7" or 8", new, one each.—BRIGG, West View, Cowling, Keighley.

Super Adept Lathe, 1⅝" centres, new and unused. Offers.—SAWNEY, 78, Easton Street, High Wycombe.

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Majesco "45" Miniature Aero-Motor (4.5 c.c.), die castings; all materials; detailed instructions; working drawings. Complete kit, 36s. (post paid).—MAJESCO MINIATURE MOTORS, 35, St. Flora's Road, Littlehampton, Sussex.

A Model (or Toy) Hot Air Engine urgently required by a model engineer for experimental purposes. Any size or condition. Excellent price paid. Write—MIERS, 58, Talbot Road, London, W.2, or 'Phone Bayswater 3680 before 9 a.m. or after 8 p.m.

¾" Scale "Princess Marina," about finished, boiler and tender finished, £65 or offer; also castings, 3½" to 7½".—WOODHEAD, Calow, Nr. Chesterfield.

¾" × ¾" Vertical Marine Engine, suitable 6' 0" boat, engineer built, bargain, £8.—71, Edenbridge Road, Bush Hill Park, Enfield.

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"Variac" Auto Transformer, 230-0 to 230, at 8 amp., £8 10s. or near offer. Totally enclosed flange mounting A.C. ¼ h.p., 400/440/3/50, 2,800 r.p.m., as new, £6 10s.; 1/3 h.p. D.C. 220 volt, £4 10s.; ball races, as new, 3/16" I.D., ½" O.D., 2s. each; ¼ h.p. 230/3/50, suitable re-winding, 30s., as new. Wanted, 5" B.G.S.C. Lathe.—BATESON, 30, Mile Cross Terrace, West End, Halifax.

¼ H.P. A.C., 240, 50 cycles, B.T.H. Motor. Small compressor, approx. 2" bore and stroke, £5 10s.—93, Broadlands Avenue, Enfield, Midx.

D.C. Motors For Sale, 650 watt Petter Dynamo, 50 volts, 950 r.p.m., complete, £8 10s.; ¼ h.p. Crompton Motor, 110 volts, 1,450 r.p.m., shunt, £7 10s.; ¼ h.p. L.D. & M. Co., 110 volts, 2,850 r.p.m. complete, £8 10s.; ¼ h.p. Crompton Parkinson, 110 volts, 1,425 r.p.m., complete, £7 10s.; ¼ h.p. Neco geared Motor, 110 volts, 27 r.p.m., complete, £12 10s.; ¼ h.p. Emerson U.S.A., 50 volts, 1,750 r.p.m., complete, £5; 1½ h.p. Batwin, 250 volts, 1,725 r.p.m., complete, £10; Magnetic Chuck, Humphries, 110 volts, D.C., 13½" × 6⅝", £6; Transformers, G.E.C., 2.84 KV.A., 1 phase, primary 105 volts, secondary, 7 tappings, 96 to 40 volts, in metal case with regulator, £7; Foster, 1 phase, 210-50 volts, 20 amp., £5; 6" Rotary Milling Table, little used, £10. Offers considered.—Box No. 4146, MODEL ENGINEER Offices.

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Monomarks. Permanent London Address. Letters redirected. Confidential, 5s. p.a. Royal patronage. Write—MONOMARK, BM/MONO6, W.C.1.

Wanted, "Model Sailing Craft," by Daniels and Tucker. Also any other advanced books on the subject of sailing craft construction and design.—BLYTH, Hillsborough, Gerrard's Cross.

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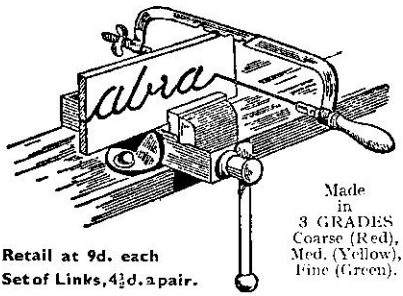

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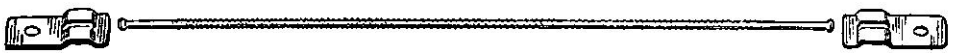

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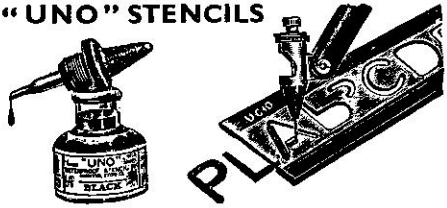

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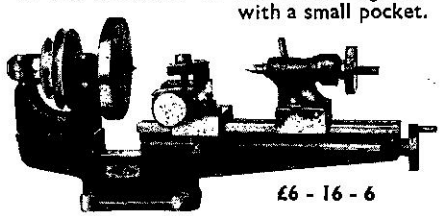

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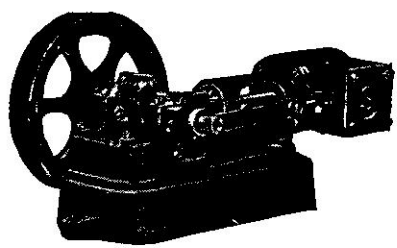

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